

MARYLAND HEALTH CARE COMMISSION

Health Information Technology

An Assessment of Maryland Acute Care Hospitals

CRAIG P. TANIO, M.D., CHAIR
BEN STEFFEN, EXECUTIVE DIRECTOR

January 2017



Commissioners

Craig P. Tanio, MD, Chair
CEO and Founder, Rezilir Health

Frances B. Phillips, RN, MHA, Vice Chair
Health Care Consultant

John E. Fleig, Jr.
Chief Operating Officer
UnitedHealthcare
MidAtlantic Health Plan

Elizabeth A. Hafey, Esq.
Associate
Miles & Stockbridge P.C.

Jeffrey Metz, MBA, LNHA
President and Administrator
Egle Nursing and Rehab Center

Robert Emmet Moffit, PhD
Senior Fellow
Health Policy Studies
Heritage Foundation

Gerard S. O'Connor, MD
General Surgeon in Private Practice

Michael J. O'Grady, PhD
Principal, Health Policy LLC, and
Senior Fellow, National Opinion Research Ctr
(NORC) at the University of Chicago

Andrew N. Pollak, MD
Professor and Chair
Department of Orthopaedics
University of Maryland School of Medicine
Chief of Orthopaedics
University of Maryland Medical System

Randolph S. Sergeant
Vice President and Deputy General Counsel
CareFirst BlueCross BlueShield

Diane Stollenwerk, MPP
President
StollenWerks, Inc.

Stephen B. Thomas, PhD
Professor of Health Services Administration
School of Public Health
Director, Maryland Center for Health Equity
University of Maryland, College Park

Cassandra Tomarchio
Business Operations Manager
Enterprise Information Systems Directorate
US Army Communications Electronics Command

Adam J. Weinstein, MD
Medical Director
Nephrology and Transplant Services
Shore Health System

Maureen Carr York, Esq.
Public Health Nurse and Health Care Attorney
Anne Arundel County

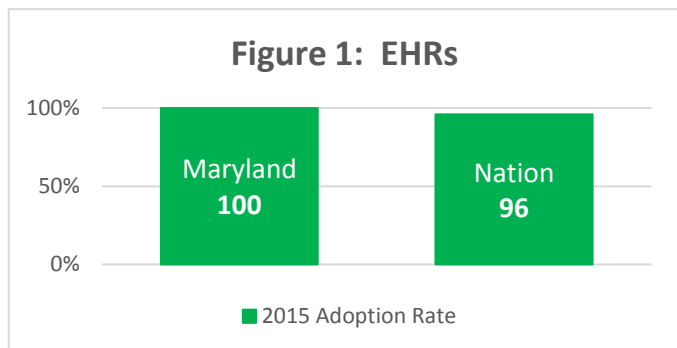
TABLE OF CONTENTS

Introduction	3
About the Assessment.....	4
Limitations.....	4
Electronic Prescribing.....	4
Patient Portals.....	5
Automated Surveillance Technology	7
Image Exchange.....	8
Health Information Exchange	9
Population Health Management.....	11
Telehealth	13
Mobile Applications	17
EHR Incentive Programs	18
Remarks.....	19
Acknowledgements.....	20
Appendix A: Health IT Definitions.....	22
Appendix B: 2015 Survey Questions	23
Appendix C: Health IT Diffusion.....	33
Appendix D: Patient Portal Funtionalities	36
Appendix E: Population Health Management Tools.....	40
Appendix F: Telehealth Capabilities and Implmentation Status	43
Appendix G: Health IT Growth Rate	47
Appendix H: Mobile Applications	48
Appendix I: EHR Incentive Payments	52

This report was completed by Nikki Majewski, Chief, Health Information Technology, within the Center for Health Information Technology & Innovative Care Delivery under the direction of the Center Director, David Sharp, Ph.D. For information on this report, please contact Nikki Majewski at 410-764-3839 or by email at nicole.majewski@maryland.gov.

INTRODUCTION

Health care reform depends on widespread adoption of health information technology (health IT).¹ Federal efforts have significantly spurred innovation in care delivery using health IT with the goals of improving quality, efficiency, and satisfaction among consumers and providers. The American Recovery and Reinvestment Act (ARRA) of 2009² established incentive payments to hospitals and other health care providers to promote the adoption and meaningful use of health IT. The Health Information Technology for Economic and Clinical Health (HITECH) Act, enacted as part of ARRA, has since made enormous strides to digitize an archaically paper-based health care system by accelerating electronic health record (EHR) adoption. Nationally, almost all acute care hospitals have adopted a certified EHR (Figure 1).^{3,4} Diffusion of EHRs within Maryland hospitals has increased twofold since 2009 with about 94 percent of hospitals reporting implementation of EHR technologies⁵ across all clinical departments.⁶



The Medicare and Medicaid EHR Incentive Programs have been pivotal in building the foundation for restructuring the health care system. While HITECH is often thought to serve as a framework for driving improvements in care delivery and patient-centered care, it has also enabled data from various health IT systems to inform the development of evolving reimbursement models.⁷ The passage of the Medicare Access and CHIP Reauthorization Act (MACRA) on October 14, 2016, is expected to increase momentum and demand for widespread use and interoperability of health IT through the expansion of value-based payment and quality reporting programs.⁸ MACRA aims to reinforce the link between value-based payment and use of health IT to coordinate care, which includes providers that had previously been ineligible for EHR adoption incentives, such as post-acute care providers.⁹

¹ Health IT refers to hardware and software, including electronic information systems, used to create, store, transmit, receive and analyze health information.

² Pub. L. No. 111-5, 123 Stat. 115, 516 (Enacted Feb. 17, 2009).

³ The national EHR adoption rate for 2014 (96.9 percent) and 2015 (96 percent) are similar, which suggests that EHR adoption among hospitals may be plateauing.

⁴ The Office of the National Coordinator for Health Information Technology (ONC), *Adoption of Electronic Health Record Systems among U.S. Non-Federal Acute Care Hospitals: 2008-2015*, No. 35, May 2016. Available at: www.healthit.gov/sites/default/files/briefs/2015_hospital_adoption_db_v17.pdf

⁵ Technologies include, but are not limited to, computerized physician order entry, clinical decision support, electronic medication administration record, bar code medication administration, and electronic prescribing. See Appendix A for definitions of these technologies.

⁶ See Appendix C for details on hospitals' implementation of health IT by a percentage of hospital departments.

⁷ Melinda Beeuwkes Buntin, Sachin H. Jain and David Blumenthal, *Health Information Technology: Laying the Infrastructure for Nation Health Reform*, Health Affairs 29, no.6 (2010): 1214-1219. Available at: content.healthaffairs.org/content/29/6/1214.full.

⁸ MACRA will be implemented in a phased approach, consolidating physician reporting programs into a unified Merit-Based Incentive Payment System and creating a new framework for Alternative Payment Models. For more information, visit: www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-MIPS-and-APMs.html.

⁹ ONC, *Connecting Health and Care for the Nation, A Shared Nationwide Interoperability Roadmap*, Final Version 1.0. Available at: www.healthit.gov/sites/default/files/hie-interoperability/nationwide-interoperability-roadmap-final-version-1.0.pdf.

ABOUT THE ASSESSMENT

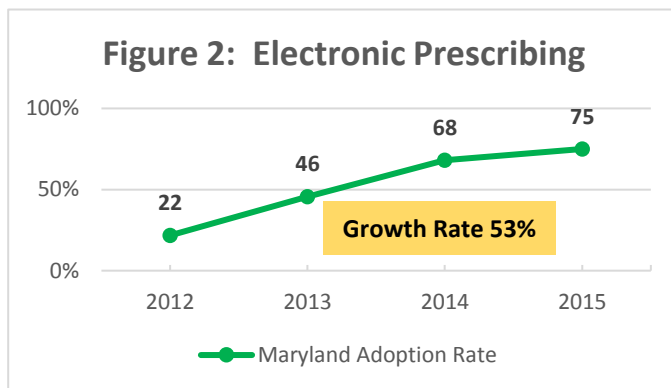
This report highlights health IT diffusion among all 48 acute care hospitals (herein “hospitals”) in Maryland.^{10, 11, 12} The report includes information on hospitals’ implementation of EHR technology, electronic prescribing (e-prescribing), patient portals, health information exchange (HIE), telehealth, population health management tools, and mobile applications. Hospitals’ participation in the Medicare and Medicaid EHR Incentive Programs is also noted.

LIMITATIONS

Hospital Chief Information Officers (CIOs) self-reported the data used in this assessment. The Maryland Health Care Commission (MHCC) collected the data through an online questionnaire¹³ and did not audit the data for accuracy. CIOs’ interpretation of the survey questions may vary, which could influence assessment findings. National benchmark data is not census level data and uses different survey methodologies; national comparisons are not available for some technologies included in this assessment.

ELECTRONIC PRESCRIBING

There continues to be uptake in hospitals’ use of e-prescribing, with adoption increasing more than threefold since 2012 (Figure 2).¹⁴ e-Prescribing technology is integrated with hospital EHR systems and enables hospitals to electronically create, modify, and send prescriptions to a patient’s preferred pharmacy as well as view information on patient medication history.^{15, 16} Access to medication history during the e-prescribing process is beneficial to managing patient safety and reconciliation across transitions of care, which is particularly beneficial in acute care settings, specifically the emergency department.¹⁷



¹⁰ Community-based hospitals (N=26); Health systems (N=22) and includes Johns Hopkins, MedStar Health, and University of Maryland Medical System.

¹¹ Levindale Hebrew Geriatric Center and Hospital, which is licensed for 120 acute beds, was included in this assessment.

¹² For historical purposes, N=46 (2012); N=46 (2013); and N=47 (2014).

¹³ See Appendix B for a listing of all survey questions.

¹⁴ See Appendix C for details on which hospitals have implemented e-prescribing, including diffusion of the technology by a percentage of hospital departments. See Appendix G for information on growth rate.

¹⁵ Agency for Healthcare Research and Quality (AHRQ), *Electronic Prescribing*. Available at: healthit.ahrq.gov/key-topics/electronic-prescribing.

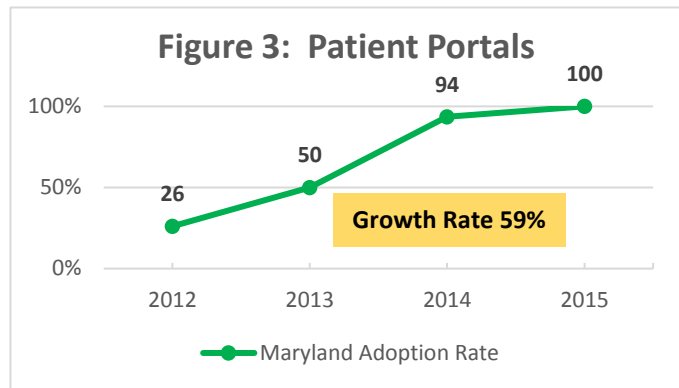
¹⁶ Other technologies, such as clinical decision support, work in tandem with e-prescribing technology. Among other things, clinical decision support issues alerts for drug-drug and drug-allergy interactions checks, enabling providers to safely prescribe medications as well as reduce potential adverse events and costs.

¹⁷ Healthcare Information and Management Systems Society, *Medication History for Hospital and Emergency Room Settings: Better Data, Better Decisions*, March 2014. Available at: www.himss.org/medication-history-hospital-and-emergency-room-settings-better-data-better-decisions.

Growth in e-prescribing can be attributed to opportunities for improving patient safety, quality of care, efficiency, accuracy, and cost savings.¹⁸ A Surescripts study found that e-prescribing can improve patient medication adherence by 10 percent, which can improve health outcomes and generate cost savings between \$140-240M nationally through reduced admissions.^{19, 20} e-Prescribing is a key component of HITECH and required by hospitals demonstrating Meaningful Use²¹ as part of the Medicare and Medicaid EHR Incentive Programs. In 2015, e-prescribing became a mandatory objective, requiring at least 50 percent of prescriptions to be sent electronically.²² The remaining 12 hospitals that have not adopted e-prescribing are preparing to meet this requirement in 2016 and report they are in the process of implementing the technology.

PATIENT PORTALS

All hospitals have implemented a patient portal (Figure 3).²³ A patient portal is a secure online website that offers patients the ability to view their health information (e.g., discharge summaries, medications, lab results, etc.) and interact with care teams by scheduling appointments, requesting prescription refills, viewing education materials and making payments, among other things.²⁴ Patient portals are considered an essential first step in



facilitating end-to-end patient engagement.²⁵ While growth of patient portals can be attributed to Meaningful Use, driving utilization of patient portals among consumers remains challenging.^{26, 27}

Meaningful Use Stage 1 required hospitals to provide at least 50 percent of patients discharged from the inpatient or emergency department with patient portal access so they could electronically view, download, or transmit (VDT) their health information.²⁸ While this measure was intended to help drive patient engagement, hospitals were only required to show they provided access, and there was no

¹⁸ Health Resources and Services Administration, *What are some benefits of e-prescribing?*,

¹⁹ Surescripts' health information network connects doctor's offices, hospitals, pharmacists, and health plans through an integrated and technology neutral platform. For more information, visit: surescripts.com.

²⁰ HITECH Answers, *Can Your Hospital Benefit from e-Prescribing?*, December 2015. Available at: www.hitechanswers.net/can-your-hospital-benefit-from-e-prescribing/.

²¹ Meaningful Use sets specific objectives that hospitals must achieve to earn financial incentives. There are three stages of Meaningful Use: Stage 1 (2011-2012) data capture and sharing; Stage 2 (2014) advance clinical processes; and Stage 3 (2016) improved outcomes. For more information, visit: www.healthit.gov/providers-professionals/meaningful-use-definition-objectives.

²² E-prescribing was originally one of six menu objectives; hospitals were required to report on only three of the six menu objectives. For more information on the new ruling, visit: www.federalregister.gov/documents/2015/10/16/2015-25595/medicare-and-medicaid-programs-electronic-health-record-incentive-program-stage-3-and-modifications.

²³ See Appendix G for information on growth rate.

²⁴ HealthIT.gov, *What is a patient portal?*, November 2015. Available at: www.healthit.gov/providers-professionals/faqs/what-patient-portal.

²⁵ AHRQ defines patient engagement as the involvement in their own care by individuals (and others they designate to engage on their behalf), with the goal that they make competent, well-informed decisions about their health and health care and take action to support those decisions.

²⁶ While Meaningful Use does not specify the means by which hospitals are to provide patients with electronic access to their health information, patient portals are most commonly used to achieve this measure.

²⁷ Becker's Health IT & CIO Review, *Beyond MU: The value of patient portal adoption*, May 2016. Available at: www.beckershospitalreview.com/healthcare-information-technology/beyond-mu-the-value-of-patient-portal-adoption.html.

²⁸ Access can also be provided to patient-authorized representatives.

requirement to capture how many patients actually attempted to VDT their health information. Meaningful Use Stage 2 changed this requirement by mandating that hospitals report the number of patients using the portals to VDT their health information.²⁹ The majority of hospitals statewide and nationally provide information to patients on how to access their portal; however, many struggle with getting patients to use the portal (Table 1).

Table 1: Patient Portals		
Hospitals	Access Provided*	Patient VDT**
	Average %	
Maryland	88	8
<i>Health Systems</i>	89	10
<i>Community Based</i>	87	6
Nation ³⁰	88	13
<p>*Numerator is the number of patients that have access to VDT their health information; denominator is the number of unique patients discharged from the hospital.</p> <p>**Numerator is the number of patients that VDT their health information; denominator is the number of patients discharged from the hospital.</p>		

Increasing awareness of patient portals requires an adept provider-patient communication strategy. Meaningful Use requirements outline basic functionality and targeted adoption rates; however, the requirements do not delineate activities required to engage patients.³¹ Patients' interest and ability to use a portal is strongly influenced by personal factors including age, ethnicity, education level, health literacy, health status, and role as a caregiver. Provider endorsement and usability of patient portals are also contributing factors.³² Hospitals offer a variety of patient engagement functionalities to patients via their portal. Over the past year, a number of hospitals have expanded the availability of certain functionalities, including bill pay and prescription refills (Table 2).³³ Nearly 73 percent of hospitals make their portal available to patients via a mobile application.³⁴ Meaningful Use Stage 3 attempts to increase patient access to their health information by encouraging the use of Application Program Interfaces (API).³⁵ Theoretically, APIs will allow patients to use whatever health IT solution they prefer to collect and display their health information electronically.

²⁹ For Meaningful Use Stage 2, the metric was initially set at 10 percent and then later dropped to five percent. A subsequent final ruling by CMS required that hospitals get at least a single patient to access the portal. Proposed rules for Meaningful Use Stage 3 aim to redefine the metric by requiring that 25 percent of patients access their records online; 35 percent engage in secure messaging with a clinical team; and 15 percent contribute patient-generated data to the portal.

³⁰ CMS, *Meaningful Use Data: Public Use Files*, Accessed July 2016. Available at: www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/PUF.html.

³¹ Journal of Medical Internet Research, *Patient Portals and Patient Engagement: A State of the Science Review*, June 2015. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC4526960/.

³² Journal of Medical Internet Research, *Patient Portals and Patient Engagement: A State of the Science Review*, June 2015. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC4526960/.

³³ See Appendix D for details on patient portal functionalities implemented by hospital.

³⁴ Refer to *Mobile Applications* section, *infra* p. 18, for more information.

³⁵ An API is a set of routines, protocols, and tools for building software applications to specify how software should interact. For more information, visit: www.webopedia.com/TERM/A/API.html.

Table 2: Patient Portals				
Functionalities		Maryland		Nation ³⁶
		2014 N=47	2015 N=48	2015
		%		
Administrative	Secure messaging*	-	63	63
	Pay bill*	32	54	74
	Pre-register for services*	14	17	-
	Request electronic copy of medical record	27	31	-
	Update insurance information*	16	16	-
Clinical	Access full medical record*	11	15	-
	Access visit summary	93	98	-
	Check test results	91	96	-
	Download information on hospital admission	86	94	-
	Self-management tools for chronic conditions*	20	21	-
	Submit patient-generated data*	16	19	37
	Request prescription refills*	27	44	44
	View patient specific education	-	42	-

Note: An asterisk (*) denotes those functionalities that may exceed the requirements of Meaningful Use, depending on how each is implemented. A strikethrough (-) denotes data is unavailable.

AUTOMATED SURVEILLANCE TECHNOLOGY

Approximately 65 percent of hospitals have implemented automated surveillance technology (AST)³⁷; almost three quarters of these hospitals have integrated the technology with their EHR.³⁸ AST is widely utilized in the inpatient setting to support identification of hospital-acquired infections (HAI)³⁹ and guide treatment decisions using evidence-based infection control practices. AST is used to analyze hospital data to issue reports retrospectively or alerts in real-time about potential outbreaks in infections and the probability of a patient developing an infection.⁴⁰ In the past, HAI surveillance required a manual review of medical records, which can be costly, time-consuming, and vulnerable to

³⁶ Becker's Health IT & CIO Review, *Patients accessing medical records online more than ever*, July 2016. Available at: www.beckershospitalreview.com/healthcare-information-technology/patients-accessing-medical-records-online-more-than-ever.html.

³⁷ Also referred to as infection surveillance software.

³⁸ See Appendix C for details on which hospitals have implemented AST.

³⁹ HAIs can be acquired by a patient in a hospital or other health care delivery setting while being treated for another condition. HAIs can be caused by an infectious agent, including bacteria, fungi, and viruses, as well as other less common types of pathogens.

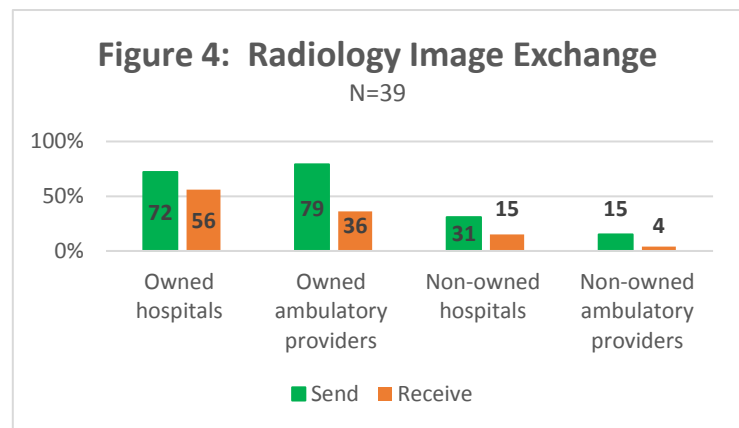
⁴⁰ Data is analyzed by way of algorithms that may use information such as microbiology results, antibiotic use data, and discharge codes, among other things.

misclassification.^{41, 42} Studies have found that hospitals using AST are more progressive in implementing infection control programs than hospitals using manual surveillance.⁴³

AST can help reduce the workload for hospitals complying with federal and State mandates for reporting HAI rates.^{44, 45} In recent years, payors have begun to require that HAI rates be reported in the advent of new pay-for-performance programs.⁴⁶ The Centers for Medicare and Medicaid Services (CMS) no longer provides reimbursement for any costs attributable to an HAI. In response to regulatory requirements and changes in reimbursement, use of AST is likely to increase as hospitals update their infection control programs to meet the demands of quality and transparency initiatives.⁴⁷ Six of the 17 hospitals that have not yet adopted AST are in the process of implementing the technology while the remaining 11 hospitals indicated no plans to implement the technology.

IMAGE EXCHANGE

Teleradiology was one of the first use cases for exchanging images from one system to another.⁴⁸ Thirty-nine hospitals exchange⁴⁹ radiology images using electronic systems⁵⁰; most of these systems (79 percent) are integrated with their EHR.⁵¹ Exchange largely occurs between owned⁵² hospitals and ambulatory providers (Figure 4). This is largely attributed to health IT solutions that enable exchange of digital images among hospitals using similar technology (i.e., health systems and affiliated entities). Five hospitals are in the process of implementing an image sharing solution; four do not have plans at this time.



⁴¹ Clinical Infectious Diseases, *Automated Surveillance for Healthcare Associated Infections: Opportunities for Improvement*, March 2013. Available at: cid.oxfordjournals.org/content/57/1/85.full.

⁴² Studies suggest manual surveillance can underreport certain infections by as much as 20 percent.

Sg2, *Automated Infection Control Surveillance*, September 2007. Available at:

www.macoalition.org/Initiatives/infections/general/september-2008/Tools/Tools/Technology%20Review.PDF.

⁴³ American Journal of Infection Control, *Hospital adoption of automated surveillance technology and the implementation of infection prevention and control programs*, Vol. 39 Issue 4, May 2011. Available at: [www.ajicjournal.org/article/S0196-6553\(11\)00088-5/abstract](http://www.ajicjournal.org/article/S0196-6553(11)00088-5/abstract).

⁴⁴ For more information on federal reporting requirements, visit: www.cdc.gov/nhsn/pdfs/cms/cms-reporting-requirements-deadlines.pdf.

⁴⁵ For more information on Maryland reporting requirements and HAI rates, visit:

healthcarequality.mhcc.maryland.gov/Article/View/22b69236-d9b7-412e-a500-52820cf6461b.

⁴⁶ Ibid⁴¹.

⁴⁷ Ibid 42.

⁴⁸ Teleradiology helps address geographic and overnight coverage shortages as well as strengthens subspecialty expertise. For more information, visit:

www.acr.org/~media/ACR/Documents/PDF/Membership/Legal%20Business/Telemedicine%20Teleradiology/ACR%20White%20Paper%20on%20Teleradiology%20Practice.pdf.

⁴⁹ Exchange includes sending images to, or receiving images from other hospitals or ambulatory providers.

⁵⁰ Hospitals traditionally store, transmit, and view images using a Picture Archiving Communication System (PACS). Over the past decade, Vendor Neutral Archives (VNAs) have become more mainstream. VNAs are enterprise-wide solutions that consolidate images from multiple departments, or PACS, enabling images to be shared and retrieved more easily.

⁵¹ See Appendix C for details on which hospitals electronically exchange radiology images.

⁵² Includes organizations owned or affiliated with a hospital or health system.

While Meaningful Use aims to increase electronic sharing of medical images using EHRs⁵³, transportable media (e.g., compact discs) is most commonly used to exchange images between providers. This process typically involves the patient providing courier services. If a provider is unable to view the images⁵⁴, another test is typically ordered, which increases cost and a patient's exposure to radiation. Hospitals and patients could benefit from a statewide image repository. Use of an HIE to support image exchange has the potential to decrease cost, minimize patient exposure to radiation, and save hospitals storage space by reducing repeat imaging.⁵⁵ A study conducted by the Journal of the American College of Radiology that examined the relationship between an HIE and cost, found providers with access to patient information through an HIE ordered fewer repeat x-rays, ultrasounds, and other imaging tests.⁵⁶

Sharing text-based radiology reports is often a service provided by an HIE. Access to supporting images can enable providers to have a more complete record of a patient's condition and gives context to text-based reports. Findings from an environmental scan conducted by MHCC in July 2016 found that while there is interest in using the State-Designated HIE, the Chesapeake Regional Information System for our Patients (CRISP), as a statewide image sharing repository, hospitals are ambiguous about whether cost savings, if any, could be realized over their current investments in image sharing solutions.^{57, 58} Nationally, only a small portion of HIEs have incorporated image exchange as part of their data sharing abilities.⁵⁹

HEALTH INFORMATION EXCHANGE

Accelerating the availability of electronic health information to guide decision making and promote care coordination is a national priority.^{60, 61} Hospitals have an important role in coordinating care with a variety of provider types (e.g., ambulatory, long-term care, home health, etc.). Use of an HIE enables greater exchange of clinical information across the care continuum. An HIE allows authorized health care providers to access and securely share electronic patient information across disparate health care organizations. Leading goals of an HIE are to improve information timeliness, quality, safety, and cost

⁵³ CMS requires imaging results consisting of the image itself and any explanation or other accompanying information to be accessible using certified electronic health record technology for hospitals participating in the EHR Incentive Programs. For more information, visit: www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/downloads/Stage2_HospitalMenu_3_ImagingResults.pdf.

⁵⁴ Use of media can contribute to inefficiencies due to lack of vendor compliance with standards and variability in vendor implementation. Images placed on media are sometimes encoded in proprietary formats instead of the Digital Imaging and Communications in Medicine (DICOM) standard. Other problems are related to the design of the embedded image viewer, which can be cumbersome to use, slow, or completely inoperable.

RadioGraphics, *Medical Image and Data Sharing: Are We There Yet?* Available at: pubs.rsna.org/doi/pdf/10.1148/rg.295095151.

⁵⁵ Calgary Scientific, *Leveraging Statewide Health Information Exchanges to Provide Fast, Efficient Image Access*, November 2015. Available at: www.calgaryscientific.com/blog/leveraging-statewide-health-information-exchanges-to-provide-fast-efficient-image-access.

⁵⁶ Healthcare Informatics, *Study: Use of Health Information Exchange Reduces Repeat Imaging Costs*, January 2016. Available at: www.healthcare-informatics.com/news-item/study-use-health-information-exchange-reduces-repeat-imaging-costs.

⁵⁷ The environmental scan explored opportunities for broadening an image exchange pilot launched by CRISP, in consultation with MHCC, in the spring of 2015. A few hospitals in the State participated in the pilot, which enabled images to be made available as part of a patient's medical record accessible through the CRISP Query Portal.

⁵⁸ MHCC, *Hospital Image Exchange: Exploring Opportunities for a Statewide Image Repository through the State-Designated Health Information Exchange*, November 2016. Available at: mhcc.maryland.gov/mhcc/pages/hit/hit/documents/CRISP_Image_Exchange_Summary.pdf.

⁵⁹ Greater Houston Healthconnect, *Image Enabling Health Information Exchange*. Available at: ghhconnect.org/ebook_image_enabling_health_information_exchange.pdf.

⁶⁰ ONC, *Federal Health IT Strategic Plan 2015-2020*, 2014. Available at: www.healthit.gov/sites/default/files/federal-healthit-strategic-plan-2014.pdf.

⁶¹ Ibid 9.

of patient care by reducing readmissions, avoiding medication errors, improving diagnoses, and decreasing duplicate testing, among other things.⁶² Increasing the availability of electronic health information is essential to facilitating care transformation, a key requirement of MACRA.⁶³

Maryland has made strides in advancing HIEs statewide. In 2009, MHCC and the Health Services Cost Review Commission designated CRISP to build the technical infrastructure to support a statewide HIE.⁶⁴ A number of regional HIEs operate in the State to facilitate local exchange activities. A total of eight HIEs that meet the statutory definition of HIE⁶⁵ are registered with MHCC⁶⁶; six are hospital-owned (Table 3).⁶⁷ Registered HIEs have adopted additional privacy and security protections above the minimum established by HIPAA and HITECH.⁶⁸ Over the last several years, technology solutions have evolved to meet the data sharing needs of providers, and many of them offer HIE services without increased privacy and security protections. A number of stakeholders have expressed concerns that the current HIE definition is too narrowly defined in statute. In 2015, MHCC worked in collaboration with stakeholders to identify needed changes in the law to the HIE definition. Broad consensus exists among stakeholders to revise the definition to ensure organizations in the State operating as an HIE adopt enhanced privacy and security protections.⁶⁹

Table 3: Registered HIEs	
1	Adventist HealthCare ■
2	Calvert Memorial Hospital ■
3	Children's IQ Network ■
4	CRISP •
5	Frederick Memorial Hospital ■
6	Peninsula Regional Medical Center ■
7	Prince George's County Public Health Information Network
8	Western Maryland Health System ■
Key: ■ Hospital-owned • State-Designated	

⁶² HealthIT.gov, *Health Information Exchange*. Available at: www.healthit.gov/providers-professionals/health-information-exchange/what-hie.

⁶³ ONC, *Interoperability among U.S. Non-federal Acute Care Hospitals in 2015*, No. 36, May 2016. Available at: www.healthit.gov/sites/default/files/briefs/onc_data_brief_36_interoperability.pdf.

⁶⁴ In 2011, Maryland required hospitals to send admission/discharge/transfer (ADT) data to CRISP, making it the first HIE in the nation to connect all acute care hospitals in a state. Since then, a large majority of hospitals contribute additional data to CRISP including, laboratory, radiology, and transcribed reports.

⁶⁵ HIE is defined as a "statewide infrastructure that provides organizational and technical capabilities to enable the electronic exchange of health information between health care providers and other health services organizations authorized by the Commission." MD Code, Health - General § 19-142(f).

⁶⁶ HIEs must renew their registration annually in order to operate in the State. COMAR 10.25.18.09, *Registration and Enforcement*.

⁶⁷ Five hospital-owned HIEs are owned and operated by acute care hospitals. These include: Adventist HealthCare, Calvert Memorial Hospital, Frederick Memorial Hospital, Peninsula Regional Medical Center, and Western Maryland Health System.

⁶⁸ Under the registration requirements set forth in the regulation, HIEs must provide MHCC with information about their privacy and security policies and procedures, audit results, and consumer education materials, among other things. For more information, visit: mhcc.maryland.gov/mhcc/Pages/hit/hit_hie/hit_hie_registration.aspx.

⁶⁹ MHCC, *Ensuring the Privacy and Security of Electronic Health Information – Keeping Pace with an Evolving HIE Landscape*, September 2016. Available at: mhcc.maryland.gov/mhcc/pages/hit/hit/documents/HIT_HIE_Definition_Brf_Rpt_20161110.pdf.

Meaningful Use requires hospitals to exchange summary of care records⁷⁰ for transitions of care⁷¹ using certified EHR technology.⁷² Use of an HIE is one method that meets Meaningful Use requirements for sharing this information.^{73,74} Nationally, more hospitals send and receive summary of care records with unaffiliated hospitals and ambulatory providers as compared to long-term care and behavioral health providers, which were previously excluded from Meaningful Use. Federal funding now allows onboarding additional Medicaid providers ineligible for participation in the Medicaid EHR Incentive Program to the HIE.⁷⁵ Exchange of clinical information across different provider types will likely increase as MACRA and Medicaid further promote electronic exchange of information across the care continuum.⁷⁶ Maryland is one of four states with the highest percentage of hospitals exchanging data with unaffiliated providers.⁷⁷

POPULATION HEALTH MANAGEMENT

Hospitals are increasingly using data analytics to support population health management efforts. This process involves leveraging large data sets (also known as “big data”) to measure a variety of factors, including mortality, health status, disease prevalence, and patient experience as a means to predict outcomes, measure trends, and establish correlations that drive quality of care and lower costs.^{78, 79} Over three quarters of hospitals report using data analytics, a 30 percent increase from the prior year.⁸⁰ Adoption of data analytics is more widespread among health systems (Figure 5).⁸¹ Health care reform and new models of care delivery are key factors driving interest in data analytics. Leveraging data analytics to improve population health is becoming an important strategy for hospitals as they transition from fee-for-service to value-based reimbursement.⁸²

⁷⁰ Summary of care documents must include specific information including, but not limited to, patient name, encounter diagnosis, vital signs, and discharge instructions. The *Consolidated Clinical Document Architecture (C-CDA)* is the standard adopted for EHR technology certification for summary of care documents. For more information, visit:

www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/2016_HealthInformationExchange.pdf.

⁷¹ CMS defines *transition of care* as the movement of a patient from one setting of care (e.g., hospital, ambulatory primary care practice, ambulatory specialty care practice, long-term care, home health, rehabilitation facility, etc.) to another.

⁷² The measure requires summary of care records to be transmitted to a receiving provider for more than 10 percent of transitions of care and referrals.

⁷³ Other acceptable transmission methods include secure e-mail, Health Information Service Provider (HISP), and query-based exchange.

⁷⁴ CMS, *EHR Incentive Programs in 2015 through 2017 Health Information Exchange*. Available at: www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/2016_HealthInformationExchange.pdf.

⁷⁵ CMS, *Availability of HITECH Administrative Matching Funds to Help Professionals and Hospitals Eligible for Medicaid EHR Incentive Payments Connect to Other Medicaid Providers*, February 2016. Available at: www.medicaid.gov/federal-policy-guidance/downloads/SMD16003.pdf.

⁷⁶ ONC, *Variation in Interoperability among U.S. Non-federal Acute Care Hospitals in 2015*, No. 37, July 2016. Available at: www.healthit.gov/sites/default/files/07.22.2016Variation_in_Interoperability_DataBrief.pdf.

⁷⁷ Alaska (89 percent), Maryland (86 percent), Rhode Island (85 percent) and Delaware (83 percent). ONC, *Non-federal Acute Care Hospital Health IT Adoption and Use*, 2015. Available at: dashboard.healthit.gov/dashboards/hospital-health-it-adoption.php.

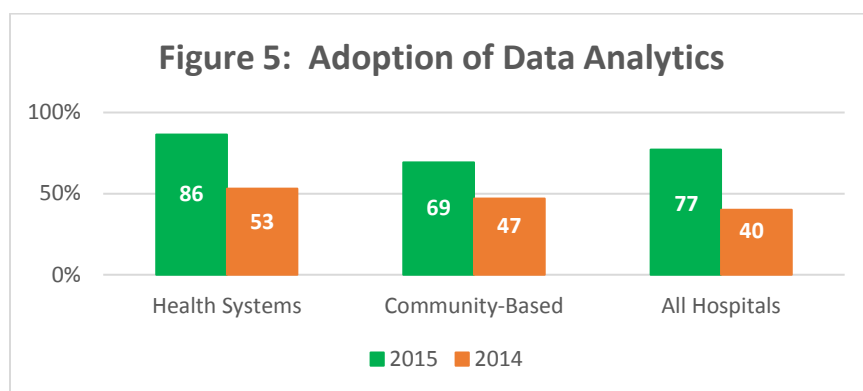
⁷⁸ Big data in health care encompasses a diversity of data types, including: clinical data from computerized physician order entry, clinical decision support systems, physician notes, prescriptions, medical imaging, laboratory, pharmacy, insurance, and other administrative data, and machine generated/sensor data, such as from monitoring vital signs, among other things.

⁷⁹ National Center for Biotechnology Information, *Big data analytics in healthcare: promise and potential*, February 2014. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC4341817/.

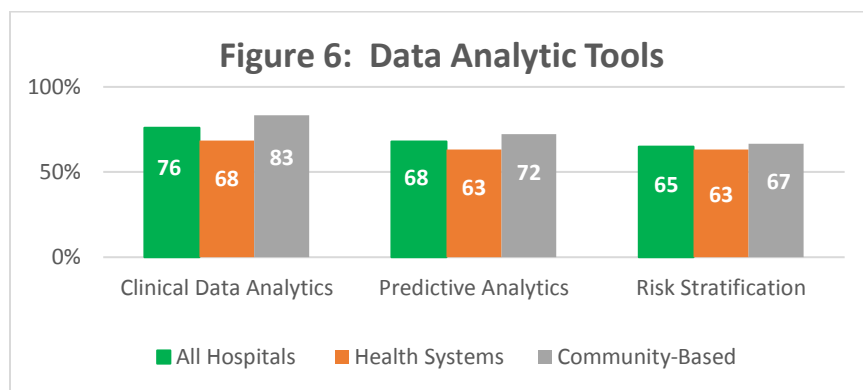
⁸⁰ About 40 percent of hospitals used data analytics in 2014; of those hospitals, approximately 53 percent were health systems, and 47 percent were community-based.

⁸¹ See Appendix E for details on which hospitals have implemented data analytics.

⁸² Healthcare Informatics, *A Roadmap for Population Health Management*.



Health IT progression spurred by HITECH began with data collection with the goals of facilitating data sharing and data analytics.⁸³ Increased focus on data analytics through greater use of EHR technology is central to achieving quality improvements and cost reductions required by health care reform.⁸⁴ The 37 hospitals that have adopted data analytics report using one or more data analytics tools; about 35 percent of these hospitals report using at least three tools (Figure 6).⁸⁵ These tools aim to support hospital efforts to drive changes in health care delivery.⁸⁶ Clinical data analytics uses data to quantify outcomes for patient populations, from readmissions and emergency department visits, including wait times and utilization of high cost services. Predictive analytics uses historical data to make predictions about the future, particularly for high risk patients.⁸⁷ Risk stratification assists in prioritizing clinical workflows, reducing system waste, and enabling efficient population management.⁸⁸ About 65 percent of these analytic tools are integrated with hospitals' EHR systems. Four of the 11 hospitals without data analytics have plans to adopt the technology while the remaining seven hospitals are undecided.



Hospital population health strategies also include creating electronic care plans to share with other providers involved in care delivery. Electronic care plans assist care coordination efforts by enabling providers to collaboratively manage a patient's care. Development of these plans can help support desired health outcomes by detailing long-term plans for maintaining health, particularly for those with

⁸³ While there has been success in data collection and data sharing, both have not significantly impacted cost or quality.

⁸⁴ Health Catalyst, *Healthcare Analytics: Realizing the Value of Health IT*. Available at: www.healthcatalyst.com/analytics-realizing-the-value-of-health-it.

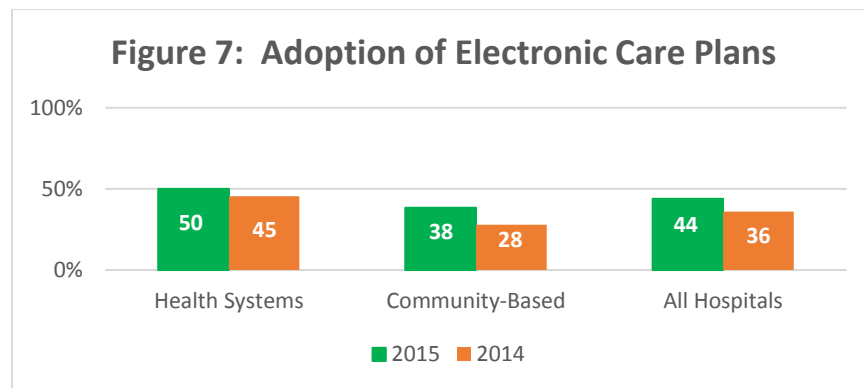
⁸⁵ The MHCC only inquired about three data analytic tools. Hospitals may use other data analytics tools than those listed.

⁸⁶ Hospitals undergo a detailed, personalized assessment of their needs, challenges, financial capabilities, and available manpower before deciding what analytics tools best meet their needs.

⁸⁷ Rock Health Research, *The Future of Personalized Healthcare: Predictive Analytics*, October 2014.

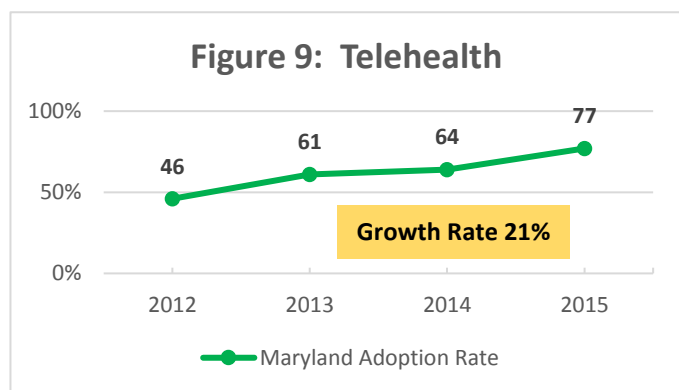
⁸⁸ Health Catalyst, *Three Approaches to Predictive Analytics in Healthcare*. Available at: www.healthcatalyst.com/three-approaches-to-predictive-analytics-in-healthcare.

chronic conditions, while also integrating short-term plans for episodic conditions. Key components of an electronic care plan include necessary steps to recover or maintain health and expectations of caregivers with whom the patient interacts, among other things.⁸⁹ Almost half of all hospitals report adopting electronic care plans; use among health systems is slightly higher than community-based hospitals (Figure 7).⁹⁰ Ten of the 27 hospitals that are non-adopters indicated plans to implement electronic care plans while the remaining 17 hospitals are undecided.



TELEHEALTH

Interest in telehealth is growing, with the rate of adoption among hospitals increasing over the past four years (Figure 9).⁹¹ Telehealth is the delivery of health education and services using telecommunications and related technologies in coordination with a health care practitioner.^{92, 93} Use of telehealth by health systems exceeds community-based hospitals by more than 25 percent (Figure 10). This is partially attributed to health systems ability to



more easily assemble multi-disciplinary care teams as they have access to a number of hospitals across the health system.⁹⁴ Telehealth services are largely concentrated in teleradiology followed by telediagnosis, teleconsultation, and emergency-based services (Table 4).⁹⁵ A large majority (78 percent) use real-time telehealth technologies (Table 5) that provide health care providers and patients with live

⁸⁹ Hospital & Health Networks, *From the Electronic Health Record to the Electronic Health Plan*, August 2015. Available at: www.hhnmag.com/articles/3272-from-the-electronic-health-record-to-the-electronic-health-plan.

⁹⁰ See Appendix E for details on which hospitals have implemented electronic care plans.

⁹¹ See Appendix C for details on which hospitals have implemented telehealth. See Appendix G for information on growth rate.

⁹² The term telehealth encompasses both clinical and non-clinical services delivered remotely, whereas the term telemedicine is restricted to clinical services only.

⁹³ MHCC, *Maryland Telemedicine Task Force Final Report*, October 2014. Available at: mhcc.maryland.gov/mhcc/pages/home/workgroups/documents/tlmd/tlmd_ttf_rpt_102014.pdf.

⁹⁴ HealthcareIT News, *The Top Five Reasons Health Systems Want Telehealth – and the One Hurdle*, February 2016. Available at: www.healthcareitnews.com/news/top-five-reasons-health-systems-are-adopting-telehealth-and-one-hurdle-they-face.

⁹⁵ See Appendix F for hospital telehealth capabilities.

video and conferencing capabilities.⁹⁶ Nationally, about 52 percent of hospitals have adopted telehealth.⁹⁷

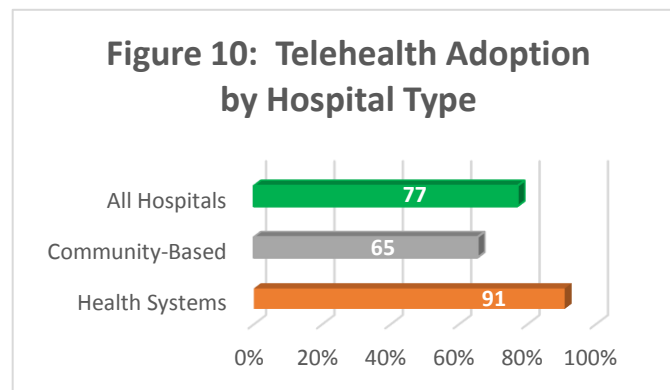


Table 4: Telehealth Services

Service Type	Hospitals % N=37
Teleradiology*	76
Telediagnosis	43
Teleconsultation	43
Emergency	35
Telebehavioral Health	22
Remote Patient Monitoring	16
Note: *Excludes after hour radiology solutions, such as Nighthawk services	

Table 5: Telehealth Technologies

Technology Type	Hospitals % N=37
Real-time	78
Store-and-forward	38

The shift towards more integrated care delivery and new reimbursement models is contributing to increased diffusion of telehealth. A primary aim of hospital telehealth programs is to reduce admissions and readmissions.⁹⁸ Many hospitals report telehealth capabilities; however, adoption statewide is in various phases from exploratory discussions to deploying telehealth projects in specific departments or specialties and identifying ways to sustain those projects overtime (Table 6).⁹⁹ These projects include virtual consultations with emergency room physicians, telestroke services extending coverage for neurologists not located on-site, and remote patient monitoring services where intensivists and critical care nurses oversee patients in off-site intensive care units.¹⁰⁰ All hospitals report that improving

⁹⁶ See Appendix F for hospital telehealth capabilities.

⁹⁷ Data as of 2013. American Hospital Association, *The Promise of Telehealth for Hospitals, Health Systems, and Their Communities*, January 2015. Available at: www.aha.org/research/reports/tw/15jan-tw-telehealth.pdf.

⁹⁸ Hospital readmissions for Medicare patients are estimated to cost roughly \$26B annually.

⁹⁹ See Appendix F for hospital telehealth implementation status.

¹⁰⁰ University of Maryland eCare is a program that expands lifesaving care in nine hospitals across the State through remote patient monitoring. For more information, visit: umms.org/services/ecare.

quality of care is the leading reason for adopting telehealth (Table 7). Increasing patient satisfaction is another driving factor since telehealth provides convenient after-hours care options and reduces wait and travel times associated with accessing care in traditional settings.¹⁰¹ Telehealth is a component of new models of care delivery under the All-Payer Model¹⁰², in addition to MACRA.¹⁰³

Table 6: Telehealth Status	
Phase	Hospitals % N=37
Under Consideration/Development	11
Pilot	14
Implementation	14
Optimization	19
Sustain	21
Multiple Projects	21
Key: <ul style="list-style-type: none"> - <u>Under Consideration/Development:</u> Exploring telehealth; telehealth adoption planned by hospital and in some cases, implementation in progress - <u>Pilot:</u> Conducting limited telehealth tests/trials for a limited period of time - <u>Implementation:</u> Incorporating telehealth technology into clinical workflows and educating staff within a hospital department or departments - <u>Optimization:</u> Telehealth technologies fully functional and telehealth services actively being rendered by hospital department(s) - <u>Sustain:</u> Mature telehealth program; secured funding and general cultural acceptance to support telehealth - <u>Multiple Projects:</u> Several telehealth projects underway, which can be in various phases - <u>Undecided:</u> Hospital plans to implement telehealth unknown. 	

¹⁰¹ Approximately 97 percent of patients report satisfaction with an online telehealth encounter.
Ibid 94.

¹⁰² In January 2014, Maryland entered into a five-year innovation grant from CMS for a new All-Payer Model (Model). The aim of the Model is to shift from a system that rewards additional volume of health services to one that improves the health of the population as a whole in a region. For more information, visit: innovation.cms.gov/initiatives/Maryland-All-Payer-Model/.

¹⁰³ For more information about Maryland's Care Redesign Programs, visit: www.hscrc.maryland.gov/care-redesign.cfm.

Table 7: Factors Driving Telehealth Adoption	
Reason	Hospitals % N=37
Improving Quality of Care	100
Increasing Operational Efficiencies	89
Increasing Patient Satisfaction	84
Increasing Physician and Other Hospital Staff Satisfaction	73
Reducing Readmissions	68
Creating Competitive Advantage	51
Increasing Profitability/Revenue	51
Reaching New Patients	46
Cost-Containment Measure	43
Research/Academic	38

Developing telehealth programs requires broad consideration of hardware, software, and network capabilities; in addition to budgets, people, processes, licensure, liability, and privacy and security, among other things.^{104, 105} Leading challenges reported by Maryland hospitals that have adopted telehealth include workflow integration and technology costs (Table 8). Notably, reimbursement has long been a barrier to telehealth adoption, particularly due to differences in how payors (i.e., Medicare, Medicaid, and commercial payors) reimburse for telehealth.¹⁰⁶ The potential for telehealth to drive down utilization costs by preventing hospital visits and supporting care management presents opportunities for hospitals operating under alternative reimbursement models.¹⁰⁷

Table 8: Telehealth Challenges		
Challenge	Hospitals %	
	Adopters N=37	Non-Adopters N=11
Cost to acquire, implement, and maintain telehealth technology	73	100
Integration into existing clinical workflows	78	64
Lack of Reimbursement	54	73
Administrative and physician engagement/buy-in	54	18
Credentialing challenges	51	18
Multi-state licensing requirements	43	36
Sustainability	41	27
Barriers in technical infrastructure	22	55
Secure/HIPAA-compliance	14	27

¹⁰⁴ FierceHealthcare, *What's necessary for a sustainable telehealth program?*, May 2014. Available at: www.fiercehealthcare.com/it/what-s-necessary-for-a-sustainable-telehealth-program

¹⁰⁵ Ibid 97.

¹⁰⁶ Currently, 29 states (including Maryland) and the District of Columbia have mandates for commercial reimbursement of care provided through telehealth. Legislation is under consideration in several other states. Most states have a policy for telehealth reimbursement under Medicaid, with significant variation from state-to-state. One of the largest barriers for reimbursement is with Medicare, which requires the patient setting be in a rural location.

Ibid 94.

¹⁰⁷ Hospital & Health Networks, *Telehealth Promises to Reshape Health Care*, March 2015. Available at: www.hhnmag.com/articles/3648-telehealth-promises-to-reshape-health-care.

MOBILE APPLICATIONS

As the health care industry continues to transform, hospitals are turning to mobile applications to optimize the health and care of patients (also known as mobile health or mHealth). Mobile applications are software programs developed to run on smartphones and other mobile communication devices that can alter the way health care is delivered from operations to the patient experience.¹⁰⁸ Mobile applications can assist with health record maintenance and access, communications and consulting, reference and information gathering, patient management and monitoring, and clinical decision-making, among other things.¹⁰⁹ A number of hospitals have deployed mobile applications to assist providers in care delivery. Most commonly used are applications to view data from EHRs, including lab results (Table 9).¹¹⁰

Table 9: Hospital Staff Mobile Applications					
N=44 %					
EHR	Lab Results	Medical Device Capabilities	Medical Images	Physician Referral/Directory	Practice Management
84	77	7	57	27	20
<ul style="list-style-type: none"> - EHR: Access EHRs, clinic schedules, patient lists, etc. - Lab Results: View results, such as labs, EEGs, EKGs, etc. - Medical Device Capabilities: Conduct some level of assessment (e.g., an electrocardiogram device to detect abnormal heart rhythms). - Medical Images: View medical images, such as MRIs, PETs, etc. - Physician Referral/Directory: Search for a physician by name, location, or specialty; request appointments or contact physicians; explore services, insurance and billing. - Practice Management: Log and transmit billing information; request prescription refills, etc. 					

Hospitals are also beginning to adopt consumer-facing mobile applications to help patients manage their own health and wellness, promote healthy living, and provide timely access to useful information.¹¹¹ Among the most commonly deployed mobile application is a patient portal (Table 10).¹¹² For the most part, diffusion of consumer-facing mobile applications has been minimal.¹¹³ A study of hospitals nationally found that only two percent of patients are using mobile applications.¹¹⁴ Leading issues impacting utility of consumer-facing applications are ease of use, health literacy, and patient privacy (Table 11).¹¹⁵ Innovation and advancement of mobile applications are expected to advance hospital

¹⁰⁸ Elsevier Clinical Solutions, *Mobile Applications and the Future of Healthcare*, 2015. Available at: healthysocialmediasite.files.wordpress.com/2016/09/elsevier-mobile-applications-and-the-future-of-healthcare.pdf.

¹⁰⁹ Ventola CL. *Mobile Devices and Apps for Health Care Professionals: Uses and Benefits*. Pharmacy and Therapeutics. 2014;39(5):356-364.

¹¹⁰ See Appendix H for information on the implementation of mobile applications by hospital.

¹¹¹ U.S. Food & Drug Administration, *Mobile Medical Applications*, September 2015. Available at: www.fda.gov/medicaldevices/digitalhealth/mobilemedicalapplications/default.htm.

¹¹² See Appendix H for information on the implementation of mobile applications by hospital.

¹¹³ Refer to *Patient Portal* section, *supra* p. 6, for more information.

¹¹⁴ MobiHealthNews, *Accenture: Just 2 percent of patients at top hospitals are using health apps provided to them*. January 2016. Available at: www.mobihealthnews.com/content/accenture-just-2-percent-patients-top-hospitals-are-using-health-apps-provided-them.

¹¹⁵ Net Solutions, *Top Challenges Facing Mobile Healthcare And How to Overcome Them*, March 2016. Available at: www.netsolutionsindia.com/blog/top-challenges-facing-mobile-healthcare-and-how-to-overcome-them/.

mHealth efforts designed to better engage patients and succeed in an era of individualized health care, where patients are becoming more empowered to help manage their care.¹¹⁶

Table 10: Consumer-Facing Mobile Applications			
N=35 %			
Emergency/ Urgent Care	Medication Tracking	Patient Portal	Physician Directory
3	6	100	34
<p>- Emergency/Urgent Care: Check ER/urgent care wait times; find nearest ER/urgent care facilities; obtain directions, hours, and contact information.</p> <p>- Medication Tracking: Track medication dosage/intervals; set and receive reminders; learn about medications.</p> <p>- Patient Portal: View health information (e.g., discharge summaries, medications, lab results, etc.) and interact with care teams by scheduling appointments.</p> <p>- Physician Directory: Search for a physician by name, location, or specialty; request appointments or contact physicians; explore services, insurance and billing.</p>			

Table 11: Utilization Challenges with Consumer-Facing Mobile Applications	
Issue	Reason
Ease of Use	Unintuitive; hard to comprehend; varying platforms (e.g., iOS, Android, Windows, etc.)
Health Literacy	Varying levels of literacy for end users
Patient Privacy	Highly sensitive data; failure to impart a sense of security and protections to users
<p>Source: Net Solutions, <i>Top Challenges Facing Mobile Healthcare And How to Overcome Them</i>, March 2016. Available at: www.netsolutionsindia.com/blog/top-challenges-facing-mobile-healthcare-and-how-to-overcome-them/.</p>	

Mobile applications can support hospitals in care delivery as they place more emphasis on prevention and management of chronic health conditions for their patient populations (e.g., diabetes, heart disease, etc.). mHealth technologies have the potential to become invaluable tools for hospitals in reducing admissions and readmissions. New technologies, such as wearables (e.g., Fitbits, Fuelbands, etc.), are beginning to influence the health care landscape and gain traction. These devices collate data and provide information about health conditions.¹¹⁷

EHR INCENTIVE PROGRAMS

As part of HITECH, the federal government allocated roughly \$27B for the Medicare and Medicaid EHR Incentive Programs to encourage hospitals and other eligible providers to adopt certified EHR technology. The intent of these programs was to promote Meaningful Use of EHRs to: improve quality, safety, efficiency, and reduce disparities in health care; engage patients and families in their health care;

¹¹⁶ Ibid 109.

¹¹⁷ Over 70 million people in the United States are estimated to be using wearable devices to monitor their physical activity, sleep patterns, calorie consumption, etc. Ibid 115.

improve care coordination; enhance population and public health; and maintain privacy and security of electronic health information.¹¹⁸ Nearly 98 percent of hospitals locally and nationally have demonstrated Meaningful Use.^{119, 120, 121} Maryland has received more than \$300M in incentive payments, with the average received by a hospital exceeding well over \$1M (Table 12).¹²² Nationally, the Medicare program has distributed over \$14B to hospitals.¹²³

Table 12: EHR Incentive Payments		
Maryland Payments	Medicare	Medicaid
Total Distributed	\$223M	\$83M
Average Received (per hospital)	\$4.8M	\$1.8M

CMS announced plans in January 2016 to restructure Meaningful Use under MACRA. MACRA establishes a new framework that will change how Medicare pays for health care services through the implementation of two new payment systems (referred to as the Quality Payment Program) by 2019.¹²⁴ This framework will reward providers for value over volume and streamlines existing quality-reporting programs. Hospitals can build upon their success in Meaningful Use as they prepare to meet new metrics that aim to link optimization of EHR data and quality.

REMARKS

Maryland hospitals have made notable progress in establishing the necessary infrastructure to store, protect, retrieve, and securely transfer electronic health information. A health IT infrastructure that is flexible and can support innovation is essential for the success of Maryland's All-Payer Model and health care reform efforts statewide. Health IT can enable the delivery of high-quality care, as well as continuous learning through each patient encounter. Over the next year, hospitals are expected to continue enhancing their health IT systems to improve care delivery, establish better care coordination, and ensure more successful patient transitions.

¹¹⁸ CMS, *Medicare & Medicaid EHR Incentive Program*, 2010. Available at: www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/downloads/MU_Stage1_ReqOverview.pdf.

¹¹⁹ Medicaid also offers incentive payments to hospitals that adopt/implement/upgrade (AIU) to certified EHR technology in their first year of participation. Hospitals must have at least a 10 percent Medicaid patient population.

¹²⁰ Hospitals demonstrate meaningful use by successfully attesting through either the CMS Medicare EHR Incentive Program Attestation System or through the State's Medicaid EHR Incentive Program Attestation System.

¹²¹ ONC, *Hospitals Participating in the CMS EHR Incentive Programs*, 2015. Available at: dashboard.healthit.gov/quickstats/pages/FIG-Hospitals-EHR-Incentive-Programs.php.

¹²² See Appendix I for information on share of EHR incentive payments by community-based hospitals and health systems.

¹²³ CMS, *Data and Program Reports*, December 2016. Available at: www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/dataandreports.html.

¹²⁴ The two systems seek to align Medicare fee-for-service payments with outcomes through the new Merit-based Incentive Payment System (MIPS) and encourage participation in alternative payment models (APMs). APMs will move away from fee-for-service payments, and focus more on quality and cost for certain episodes of care (e.g., bundled payments) and patient populations (accountable care organizations).

American Hospital Association, *Physician Payment Reform Under the MACRA*, July 2016. www.aha.org/content/16/16macraissuebrief.pdf.

ACKNOWLEDGEMENTS

The MHCC thanks hospital CIOs for their contributions to this annual hospital health IT assessment. The MHCC appreciates the donation of time by hospital CIOs in reviewing the draft report.

Anne Arundel Medical Center
Barbara Baldwin
Director, Information Systems
Applications

Atlantic General Hospital
Andrew Fowler
Chief Information Officer

Bon Secours Baltimore Health
System
Sanjay Purushotham
Executive Director of
Information Services

Calvert Memorial Hospital
Phil Campbell
Vice President, Information
Services
Chief Information Officer

Carroll Hospital Center
Tressa Springmann
Vice President, Chief
Information Officer

Doctors Community Hospital
Phillip Lavin
Director of Information
Technology

Fort Washington Medical
Center
Fred Ashby
Director, Information
Technology/
Telecommunications

Frederick Memorial Hospital
David Quirke
Vice President, Chief
Information Officer

Garrett County Memorial
Hospital
Steven Peterson
Director Information Systems

Greater Baltimore Medical
Center
David Hynson
Vice President, Chief
Information Officer

Holy Cross Hospital
Matt Trimmer
Senior Director, Information
Technology Services

Holy Cross Germantown
Hospital
Matt Trimmer
Senior Director, Information
Technology Services

Howard County General
Hospital
Jim Young
Senior Vice President Finance,
Chief Financial Officer

Johns Hopkins Bayview
Medical Center
Stephanie Reel
Chief Information Officer

Johns Hopkins Hospital
Stephanie Reel
Chief Information Officer

Laurel Regional Hospital
Bryan Benton
Deputy Chief Information
Officer/Director of
Information Technology
Operations

Levindale Hebrew Geriatric
Center and Hospital
Tressa Springmann
Vice President, Chief
Information Officer

McCready Health
Ken Kirchner
Systems Analyst

MedStar Franklin Square
Medical Center
Stephen Mannion
Chief Information Officer

MedStar Good Samaritan
Hospital
Janet Decker
Assistant Vice President
Information Services

MedStar Harbor Hospital
Cynthia Tanenbaum
Assistant Vice President
Information Services

MedStar Montgomery Medical
Center
Christiane Brown
Assistant Vice President
Information Technology

MedStar Southern Maryland
Hospital Center
Lou Mavromatis
Vice President, Information
Services

MedStar St. Mary's Hospital
Donald Sirk
Director Information
Technology

MedStar Union Memorial
Hospital
Janet Decker
Assistant Vice President
Information Services

Mercy Medical Center
Kathleen Perry
Chief Information Officer

Meritus Medical Center
David Quirke
Vice President, Chief
Information Officer

Northwest Hospital Center
Tressa Springmann
Vice President, Chief
Information Officer

Peninsula Regional Medical
Center
Raymond Adkins
Chief Information Officer

Prince George's Hospital
Center
Bryan Benton
Deputy Chief Information
Officer/Director of
Information Technology
Operations

Shady Grove Adventist
Hospital
Christopher Ghion
Vice President, Chief
Information Officer

Sinai Hospital
Tressa Springmann
Vice President, Chief
Information Officer

St. Agnes Hospital
Alan Wyman
Chief Information Officer

Suburban Hospital
William Jason Cole
Senior Director, Information
Systems

Union Hospital of Cecil County
Anne Lara
Chief Information Officer

University of Maryland
Medical Center
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland
Baltimore Washington Medical
Center
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland Charles
Regional Medical Center
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland
Harford Memorial Hospital
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland
Medical Center Midtown
Campus
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland
Rehabilitation &
Orthopedic Institute
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland Shore
Medical Center at Chestertown
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland Shore
Medical Center at
Dorchester
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland Shore
Medical Center at Easton
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland St.
Joseph Medical Center
Jon Burns
Senior Vice President & Chief
Information Officer

University of Maryland Upper
Chesapeake Medical Center
Jon Burns
Senior Vice President & Chief
Information Officer

Washington Adventist Hospital
Christopher Ghion
Vice President, Chief
Information Officer

Western Maryland Health
System
David Quirke
Vice President, Chief
Information Officer

APPENDIX A: HEALTH IT DEFINITIONS

Barcode Medication Administration (BCMA): Use of a barcode identification scanning device to provide verification of the correct patient and medication at the point-of-care.

Clinical Decision Support (CDS): Computer application designed to assist in the clinical decision-making process at the point of care to help prevent adverse events. CDS encompasses tools such as drug-drug interaction checks, drug-allergy interaction checks, basic dosing guidance, clinical guidelines, patient specific reports, and alerts/reminders to providers

Computerized Physician Order Entry (CPOE): Enables providers to electronically generate patient orders, such as medications, tests, and other procedures, from a computer or mobile device.

Electronic Health Record (EHR): A system that makes clinical information available electronically; contains medical histories of patients and offers evidence based tools to assist in the clinical decision-making process.

Electronic Medication Administration Records (eMARs): A record of medication administered to a patient by a health care practitioner; helps improve tracking and monitoring of patients' medications and can prevent lost or misinterpreted records.

Electronic Prescribing (e-prescribing): Enables prescriptions to be generated, transmitted, and filed electronically; can include CDS as well as information on patient eligibility, formulary, and medication history.

APPENDIX B: 2015 SURVEY QUESTIONS

Listed below are the questions included in the 2015 hospital health IT survey.

Electronic Health Records

- 1) Has an EHR system been implemented in all hospital departments? (yes/no) (If no, skip to question 1a; if yes, skip to question 1b)
 - a. What percentage of hospital departments use the EHR?
 - b. Identify the hospital's EHR vendor:
 - c. Select those technologies that are integrated with the hospital's EHR and indicate the percentage of hospital departments that use each technology.

Technology	Integrated with EHR (check if yes)	Percent of Hospital Departments Using Technology (put 0% if technology not implemented)
Computerized physician order entry		
Clinical decision support		
Electronic medication administration records		
Bar code medication administration		

Infection Surveillance Software/Automated Surveillance Technology

- 1) Does the hospital use infection surveillance software (ISS), or automated surveillance technology (AST), to manage infectious diseases? (If no, skip to *Planning* question)

For purposes of this survey, ISS/AST are systems that automate the collection and analysis of clinical data from different hospital information systems, allowing hospital staff to identify and address hospital acquired infections. ISS/AST also helps facilitate reporting to State and federal agencies.

- a. Is ISS/AST integrated with the hospital's EHR? (yes/no)
 - b. Identify the specific care settings (e.g., inpatient hospital admission, hemodialysis unit, same-day surgery, etc.) that uses ISS/AST:
 - c. Does the hospital primarily use ISS/AST for mandatory government reporting? (yes/no)
 - d. Which of the following processes does the hospital's ISS/AST use to produce reports: (check all that apply)
 - Batched surveillance processes (e.g., routine monitoring of public health)
 - Real-time surveillance process (e.g., the examination of specific threats as they arise)
 - Other (specify)
- 2) Please select the response that most accurately describes your hospital's plans to implement ISS/AST:
 - Planning to implement ISS/AST by the end of 2016
 - No plans to implement ISS/AST at this time

- In the process of implementing ISS/AST - Expected completion date:

Electronic Prescribing

External E-Prescribing

- 1) What percentage of hospital departments e-prescribe discharge medications to pharmacies outside of the hospital? (If 0 percent, skip to *Planning* question)
 - a. Is this technology integrated with the hospital's EHR? (yes/no)
- 2) Please select the response that most accurately describes your hospital's plans to implement e-prescribing for external purposes:
 - Planning to implement e-prescribing for external purposes by the end of 2016
 - No plans to implement e-prescribing for external purposes at this time
 - In the process of implementing e-prescribing for external purposes-Expected completion date:

Health Information Exchange – Radiology Image Sharing

- 1) Does the hospital electronically transfer and/or receive radiology images? (yes/no) (If no, answer the *Planning* question)
 - a) Is this technology integrated with the hospital's EHR? (yes/no)
 - b) Identify your radiology image sharing vendor(s):
- 2) Does your hospital send and/or receive radiology images to/from the following: (select all that apply)

Type of Organization	Send (i.e., electronic transmission of radiology images) (check if yes)	Receive (i.e., electronic receipt of or access to radiology images) (check if yes)
Hospitals owned by the hospital or health system		
Ambulatory practices owned by the hospital or health system		
Non-owned hospitals outside the hospital or health system		
Non-owned ambulatory providers (i.e., providers <u>not</u> owned by the hospital or health system)		
Other (specify)		

- 3) Please select the response that most accurately describes your hospital's plans to implement radiology image sharing:
 - Planning to implement a radiology image sharing vendor by the end of 2016
 - No plans to electronically share radiology images at this time

- In the process implementing a radiology image sharing vendor - Expected completion date:

Health Information Exchange – Participation

For purposes of this survey, HIE does NOT include participation with Maryland's State-Designated HIE, the Chesapeake Regional Information System for our Patients (CRISP). The survey questions that follow are inquiring about use of an HIE and/or HIE tools offering organizational and technical capabilities for the electronic exchange of health care information between various health care entities that may or may not be among common ownership/affiliation. Exchange means the electronic transmission of data to the HIE, and/or receipt of or access to data (e.g., query), from the HIE.

- 1) Does your hospital participate with an HIE: (yes/no) (If no, answer the *Planning* question)
 - a. Identify the HIE name: _____
 - b. Is the HIE owned and operated by the hospital (yes/no)
- 2) Which of the following organizations does the hospital electronically exchange data with (select all that apply)

Type of Organization	Send (i.e., electronic transmission of data to the HIE) (check if yes)	Receive (i.e., receipt of data or access to data (e.g., query) from the HIE) (check if yes)
Internal Organizations:		
Other hospitals owned or affiliated with the hospital or health system		
Ambulatory providers owned or affiliated with the hospital or health system		
None		
External Organizations:		
Outside hospitals (i.e., hospitals that are <u>not</u> owned or affiliated with the hospital or health system)		
Outside ambulatory providers (i.e., ambulatory providers that are <u>not</u> owned or affiliated with the hospital or health system)		
Long term care facilities		
State Agencies (e.g., Department of Health and Mental Hygiene)		
Federal Agencies (e.g., Centers for Medicare & Medicaid Services)		
Other (specify)		
None		

- 3) What types of data does your hospital electronically exchange with internal and external organizations via the HIE: (select all that apply)

Type of Data	Internal Organizations		External Organizations	
	Send (i.e., electronic transmission of data to the HIE) (check if yes)	Receive (i.e., receipt of data or access to data (e.g., query) from the HIE) (check if yes)	Send (i.e., electronic transmission of data to the HIE) (check if yes)	Receive (i.e., receipt of data or access to data (e.g., query) from the HIE) (check if yes)
Laboratory Results				
Radiology Reports				
Radiology Images				
Transcribed documents (e.g., clinical care summaries)				
Medication History				
Summary of Care Records (including discharge summary records)				
Other (specify)				

- 4) Please select the response that most accurately describes your hospital's plans to participate with a HIE:

- Planning to participate with an HIE by the end of 2016
- No plans to participate with an HIE at this time
- In the process of connecting with an HIE - Expected completion date and HIE name:

Patient Portals

- 1) Has your hospital implemented a patient portal? (yes/no) *(If no, skip to planning question)*
- 2) What types of services does the hospital provide to patients through the patient portal? (check all that apply)
 - Pay bill
 - Check test results
 - Access visit summary
 - Download information about a hospital admission
 - Request prescription refills
 - Self-management tools for chronic conditions
 - Update insurance information
 - Preregister for services
 - Submit patient-generated data (e.g., allowing patients with diabetes or congestive heart failure to submit self-test results)
 - Access full medical record
 - Request electronic copy of medical record
 - View patient specific education
 - Secure messaging
 - Other (specify)

- 3) Please select the response that most accurately describes your hospital's plans to implement a patient portal:
- Planning to implement a patient portal by the end of 2016
 - In the process of implementing a patient portal - Expected completion date:
 - No plans to implement a patient portal at this time

Telehealth

Telehealth is the delivery of health education and services using telecommunications and related technologies in coordination with health care practitioners. Telehealth encompasses clinical and non-clinical services delivered remotely to patients including, but not limited to, virtual consultations with primary care providers and/or specialists. Among other things, telehealth aims to increase access to care, improve transitions of care, and reduce hospital readmissions. For purposes of this survey, telehealth does not include use of phone calls, fax, or e-mail independently; however, all can be used in conjunction with a broad array of supporting telehealth technologies, including:

- Real-time (live) audio video conferencing (virtually connects patients with practitioners, sometimes referred to as virtual visits, and may serve as an alternative to an in-person visit)
- Store-and-forward software (use of non-real-time communication, including email or other electronic transmission methods, to send clinical information, such as an X-ray, to health care practitioners for clinical review)
- Remote monitoring devices (collects and transmits data on specific health indicators, such as blood pressure or heart rate, to health care practitioners for monitoring/tracking purposes)
- Mobile health (mHealth) devices (uses mobile communications devices, such as smartphones, for health services and information)

- 1) Does the hospital provide telehealth services? (If no, skip to questions #8 & 9)
- 2) What is the current status of the hospital's deployment of telehealth services? If multiple telehealth projects are at different stages, please provide additional details below indicating the current status of each project.
- Under consideration/development (exploring telehealth; telehealth not yet adopted by the hospital)
 - Pilot phase (conducting limited telehealth tests/trials for a limited period of time)
 - Implementation phase (incorporating telehealth technology into clinical workflows and educating staff within a hospital department or departments)
 - Optimization phase (telehealth technologies fully functional and telehealth services actively being rendered by hospital department or departments)
 - Sustain (mature) phase (secured funding and general cultural acceptance to support telehealth)

- Multiple telehealth projects underway (specify)
- 3) Does the hospital have a dedicated full-time program manager(s) for telehealth? (yes/no)
- 4) Which of the following types of telehealth services does the hospital support? (select all that apply)
- Teleradiology (i.e., the transmission and evaluation of radiological patient images, such as X-rays, CTs, and MRIs, from one location to another) – For purposes of this survey, teleradiology **excludes** after hour radiology solutions, such as Nighthawk services.
 - Telediagnosis (i.e., the process whereby a disease diagnosis or prognosis is made by evaluating data transmitted between distant medical facilities)
 - Telebehavioral health (i.e., using technology to virtually provide mental health services from a distance)
 - Teleconsultation (i.e., virtually connecting health care practitioners with other health care practitioners and/or patients)
 - Emergency (i.e., connections between two medical facilities in emergent situations)
 - Remote Monitoring (i.e., electronic data capture and Internet-enabled review by health care practitioners, particularly used in the management of chronic diseases)
 - Other (specify)
- 5) What types of telehealth technology capabilities are being used by the hospital? (select all that apply)
- Real-time capabilities (i.e., audio/video conferencing that virtually connects patients with practitioners, sometimes referred to as virtual visits, and may serve as an alternative to an in-person visit)
 - Store-and-forward software (use of non-real-time communications, including email or other electronic transmission methods, to send clinical information, such as an X-ray, to health care practitioners for clinical review)
- 6) What types of telehealth technologies are being used by the hospital? (select all that apply)
- Interactive video/audio (i.e., synchronous (real-time) computer-based communications between health care providers and patients)
 - Remote monitoring devices (collects and transmits data post discharge or for chronic care management on specific health indicators, such as blood pressure or heart rate of patients at home, for monitoring/tracking purposes)
 - Mobile health (mHealth) devices (uses mobile communications devices, such as smartphones or tablets, for the delivery of health services and information)
 - Other (specify)
- 7) Which of the following factors has influenced the hospital's implementation of telehealth? (select all that apply)

- Increasing operational efficiencies
- Reaching new patients
- Improving quality of care
- Increasing patient satisfaction
- Increasing physician and other hospital staff satisfaction
- Increasing profitability/revenue
- Reducing hospital readmissions
- Creating a competitive advantage
- Research/academics
- Cost-containment mechanism due to changes in health care landscape (e.g., Affordable Care Act, global budgets, etc.)
- Other (specify)

8) What challenges, if any, has the hospital experienced implementing telehealth? (select all that apply)

- Lack of reimbursement for telehealth services
- Cost to acquire, implement, and maintain telehealth technology
- Restrictions or exclusions under malpractice insurance policy
- Increase in premium for malpractice insurance
- Credentialing challenges
- Multi-state licensing requirements
- Administrative and physician engagement/buy-in
- Integration into existing clinical workflows
- Barriers in technical infrastructure
- Secure/HIPAA-compliance
- Monitoring quality of care
- Sustainability
- No challenges to report
- Other (specify)

9) Please select the response that most accurately describes your hospital's plans to implement telehealth:

- Planning to implement telehealth by the end of 2016
- In the process of implementing telehealth - Expected completion date:
- Undecided about a telehealth implementation strategy at this time

Mobile Applications

For purposes of this survey, mobile applications are software programs, or point-of-care tools, that can be downloaded and used on smartphones and other mobile communication devices (e.g., tablets) by health care professionals to assist with various tasks, such as, information and time management; health record maintenance and access; communications and consulting; reference and information gathering; patient management and monitoring; clinical decision-making; and medical education and training. Mobile applications can also provide tools to patients that help manage their own health and wellness, promote healthy living, and gain access to useful information when and where they need it.

1) What types of mobile applications are available for use by **hospital staff**: (select all that apply)

- Physician Referral/Directory (search for a physician by name, location, or specialty; request appointments or contact physicians; explore services, insurance and billing)

- EHR (access EHRs, clinic schedules, patient lists, etc.)
 - Lab Results (view results, such as labs, EEGs, EKGs, etc.)
 - Medical Images (view medical images, such as MRIs, PETs, etc.)
 - Medical Device Capabilities (use smartphone or tablet to conduct some level of assessment – for example using a smartphone as an electrocardiogram (ECG) device to detect abnormal heart rhythms or determine if a patient is having a heart attack)
 - Practice Management (log and transmit billing information; request prescription refills, etc.)
 - None (answer *planning* question)
 - Other (specify)
- 2) Please select the response that most accurately describes your hospital's plans to implement mobile applications for use by hospital staff:
- Planning to implement mobile applications for use by hospital staff in 2016
 - In the process of implementing mobile applications for use by hospital staff - Expected completion date:
 - No plans to implement mobile applications for hospital staff at this time
- 3) What types of mobile applications does the hospital make available for use by **patients**: (select all that apply)
- Medication Tracking (allows patients to track medication dosage/intervals, set and receive reminders; learn about medications)
 - Hospital Navigation (assist patients with automatic check-in, queue placement, check-out; send relevant location-based text messages)
 - Physician Directory (search for a physician by name, location, or specialty; request appointments or contact physicians; explore services, insurance and billing)
 - Emergency/Urgent Care (check ER/urgent care wait times; find nearest ER/urgent care facilities; obtain directions, hours, and contact information)
 - Patient Portal
 - None (answer *planning* question)
 - Other (specify)
- 4) Please select the response that most accurately describes your hospital's plans to implement mobile applications for use by patients:
- Planning to implement mobile applications for use by patients in 2016
 - No plans to implement mobile applications for patients at this time
 - In the process of implementing mobile applications for use by patients - Expected completion date:

Medicare & Medicaid EHR Incentive Programs

- 1) Has your hospital received notice and/or been audited by CMS for Meaningful Use? (yes/no)- *(if yes, continue to 1a.; if no, skip to Population Health Management section)*
 - a. Did audit findings require your hospital to return a portion of the incentive payment(s) received to the federal government?
 - Yes (please explain why)
 - No
 - To be determined – audit in progress

Population Health Management

Population health management includes population-based activities that systematically address the preventative and chronic care needs of patients with a focus on reducing health care costs and improving health outcomes.

For purposes of this survey, data analytics includes use of business intelligence applications that measure mortality, health status, disease prevalence, and patient experience, among other things, to predict outcomes, measure trends and establish correlations that drive quality of care and lower costs. Assessing the health status of population segments can help identify areas of population health management that may need to be strengthened and/or modified.

- 1) What types of data analytics tools does the hospital use for population health management? (select all that apply)
 - Predictive analytics (e.g., identifies potential high-risk patients before they need expensive care)
 - Clinical data analytics (e.g., examines clinical data to determine a diagnosis and treatment regimen, for instance, laboratory data, such as blood tests, urinalysis, and microscopic tissue studies)
 - Risk stratification (includes tools that identify population needs across all levels of risk so strategies on the types of outreach and interventions can be established to address patient needs across the continuum of care)
 - None (skip to *planning* question)
 - Other (specify)
- 2) Specify the date the hospital began using data analytic tools for population health management: (Month/Year)
- 3) Are data analytic tools integrated with the hospital's EHR? (yes/no)
- 4) Identify the data analytic tools vendor(s):
- 5) Please select the response that most accurately describes your hospital's plans to implement data analytics for population health management:
 - Planning to implement data analytics for population health management in 2016
 - Undecided about use of data analytics for population health management at this time

- In the process of implementing data analytics for population health management - Expected completion date:

- 6) Does the hospital have an outpatient pharmacy located on-site to fulfill patients' discharge medications before they leave the hospital? (yes/no)
- 7) Does the hospital utilize electronic patient care plans for population health management? (yes/no) (If no, skip to *planning* question)

For purpose of this survey, an electronic patient care plan is a comprehensive care planning tool that enables all provider types involved in a patient's care to coordinate/collaborate patient care pre/post discharge by facilitating access to patient information, planning, delivery and evaluation of patient care.

- 8) Specify which types of organizations the hospital shares electronic patient care plans with and the means for exchanging electronic patient care plans with those organizations:

Type of Organizations	Sharing via a HIE (check if yes)	Sharing via another means (check if yes)
Other hospitals owned or affiliated with the hospital or health system		
Ambulatory providers owned or affiliated with the hospital or health system		
Outside hospitals (i.e., hospitals that are <u>not</u> owned or affiliated with the hospital or health system)		
Outside ambulatory providers (i.e., ambulatory providers that are <u>not</u> owned or affiliated with the hospital or health system)		
Other (specify)		

- 9) Please select the response that most accurately describes your hospital's plans to implement electronic patient care plans for population care management:
- Planning to implement electronic patient care plans in 2016
 - Undecided about using electronic patient care plans at this time
 - In the process of implementing electronic patient care plans - Expected completion date:

APPENDIX C: HEALTH IT DIFFUSION

The table below details implementation of health IT by hospital, including the percent of hospital departments that utilize the specified technology. Hospital implementation of AST, a patient portal, telehealth, and radiology image exchange are noted with a check mark (✓). Strikethroughs (-) indicate technologies that have not yet been implemented by a hospital. For detailed information on hospital patient portal functionalities, refer to Appendix D. For detailed information on hospital telehealth capabilities and implementation status, refer to Appendix F.

Health IT Diffusion									
Hospitals	EHR N=48	CPOE N=48	eMAR N=48	BCMA N=48	e-Prescribe N=36	AST N=31	Patient Portal N=48	Telehealth N=37	Radiology Image Exchange N=39
	% departments using technology					Implemented			
Anne Arundel Medical Center	100	100	100	98	100	✓	✓	✓	-
Atlantic General Hospital	100	100	80	80	80	-	✓	✓	✓
Bon Secours Baltimore Health System	100	100	100	100	100	-	✓	✓	✓
Calvert Memorial Hospital	100	90	100	80	80	-	✓	✓	✓
Carroll Hospital Center	100	100	75	75	15	✓	✓	✓	✓
Doctors Community Hospital	100	100	100	100	0	-	✓	✓	-
Fort Washington Medical Center	100	75	100	75	0	-	✓	✓	✓
Frederick Memorial Hospital	100	100	96	96	0	✓	✓	✓	✓
Garrett County Memorial Hospital	100	100	100	90	75	-	✓	✓	✓
Greater Baltimore Medical Center	100	100	100	100	5	-	✓	-	✓
Holy Cross Germantown Hospital	100	100	100	75	10	✓	✓	✓	✓
Holy Cross Hospital	100	100	100	75	10	✓	✓	✓	✓
Howard County General Hospital	100	100	100	100	100	✓	✓	✓	✓
Johns Hopkins Bayview Medical Center	100	100	100	100	100	-	✓	-	✓

Health IT Diffusion									
Hospitals	EHR N=48	CPOE N=48	eMAR N=48	BCMA N=48	e-Prescribe N=36	AST N=31	Patient Portal N=48	Telehealth N=37	Radiology Image Exchange N=39
	% departments using technology					Implemented			
Johns Hopkins Hospital	100	100	100	12	0	✓	✓	✓	✓
Laurel Regional Hospital	85	100	80	85	12	-	✓	✓	✓
McCready Health	100	100	80	27	50	-	✓	-	✓
Levindale	100	100	100	100	0	✓	✓	-	-
MedStar Franklin Square Medical Center	100	100	100	100	100	✓	✓	✓	✓
MedStar Good Samaritan Hospital	100	100	100	100	100	✓	✓	✓	✓
MedStar Harbor Hospital	100	100	100	95	100	✓	✓	✓	✓
MedStar Montgomery Medical Center	100	100	100	100	100	✓	✓	✓	✓
MedStar Southern Maryland Hospital	100	100	100	100	100	✓	✓	✓	✓
MedStar St. Mary's Hospital	100	100	100	70	100	✓	✓	✓	✓
MedStar Union Memorial Hospital	100	100	100	100	100	✓	✓	✓	✓
Mercy Medical Center	95	95	95	95	0	-	✓	-	✓
Meritus Medical Center	100	90	95	95	10	✓	✓	✓	✓
Northwest Hospital Center	100	86	92	79	0	✓	✓	-	-
Peninsula Regional Medical Center	100	100	100	96	80	✓	✓	✓	✓
Prince George's Hospital Center	86	100	81	86	13	-	✓	✓	✓
Saint Agnes Hospital	100	95	95	85	5	✓	✓	✓	
Shady Grove Adventist Hospital	100	100	100	100	80	-	✓	-	✓

Health IT Diffusion									
Hospitals	EHR N=48	CPOE N=48	eMAR N=48	BCMA N=48	e-Prescribe N=36	AST N=31	Patient Portal N=48	Telehealth N=37	Radiology Image Exchange N=39
	% departments using technology					Implemented			
Sinai Hospital	100	79	89	75	0	✓	✓	-	-
Suburban Hospital	100	100	100	100	100	✓	✓	-	✓
Union Hospital of Cecil County	100	100	100	100	100	✓	✓	✓	✓
University of Maryland Baltimore Washington Medical Center	100	100	100	100	90	✓	✓	✓	✓
University of Maryland Charles Regional Medical Center	100	100	100	100	0	-	✓	✓	✓
University of Maryland Harford Memorial Hospital	100	100	100	90	50	✓	✓	✓	✓
University of Maryland Medical Center	100	100	100	100	100	✓	✓	✓	-
University of Maryland Medical Center Midtown Campus	100	100	100	100	100	✓	✓	✓	-
University of Maryland Rehabilitation & Orthopedic Institute	100	100	100	100	100	✓	✓	✓	✓
University of Maryland Shore Medical Center at Chestertown	100	100	80	60	0	✓	✓	✓	✓
University of Maryland Shore Medical Center at Dorchester	100	100	80	60	0	✓	✓	✓	✓
University of Maryland Shore Medical Center at Easton	100	100	80	60	0	✓	✓	✓	✓
University of Maryland St. Joseph Medical Center	100	100	100	100	100	✓	✓	✓	✓
University of Maryland Upper Chesapeake Medical Center	100	100	100	70	50	✓	✓	✓	✓
Washington Adventist Hospital	100	100	100	100	80	-	✓	-	✓
Western Maryland Health System	100	92	100	100	92	✓	✓	-	-
Adoption Rate (%)	100	100	100	100	75	65	100	77	81

APPENDIX D: PATIENT PORTAL FUNTIONALITIES

The table below details implementation of patient portal functionalities by hospital. Implementation of functionalities are noted with a check mark (✓). Strikethroughs (-) indicate functionalities that have not yet been implemented by a hospital. For information on hospitals that offer a mobile application for their patient portal, refer to Appendix H.

Patient Portal Functionalities													
N=48													
Hospitals	Administration					Clinical							
	Secure messaging*	Pay bill*	Preregister for services*	Request electronic copy of medical record	Update insurance information*	Access full medical record*	Access visit summary	Check test results	Download information about a hospital admission	Self-management tools for chronic conditions*	Submit patient-generated data*	Request prescription refills*	View Patient Specific education
Anne Arundel Medical Center	✓	✓	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
Atlantic General Hospital	✓	-	-	✓	✓	-	✓	✓	✓	-	-	✓	✓
Bon Secours Baltimore Health System	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Calvert Memorial Hospital	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓
Carroll Hospital Center	-	-	-	-	-	-	✓	✓	✓	-	-	-	-
Doctors Community Hospital	✓	-	-	✓	✓	✓	✓	✓	✓	-	-	-	✓
Fort Washington Medical Center	-	✓	-	-	-	-	✓	✓	✓	-	-	-	-
Frederick Memorial Hospital	-	✓	-	✓	-	-	✓	✓	✓	✓			✓
Garrett County Memorial Hospital	-	-	-	-	-	-	-	✓	✓	-	-	-	-
Greater Baltimore Medical Center	-	-	-	✓	-	-	✓	✓	✓	-	-	✓	
Holy Cross Germantown Hospital	-	✓	✓	-	-	-	✓	✓	✓	-	-	-	-

Patient Portal Functionalities													
N=48													
Hospitals	Administration					Clinical							
	Secure messaging*	Pay bill*	Preregister for services*	Request electronic copy of medical record	Update insurance information*	Access full medical record*	Access visit summary	Check test results	Download information about a hospital admission	Self-management tools for chronic conditions*	Submit patient-generated data*	Request prescription refills*	View Patient Specific education
Holy Cross Hospital	-	✓	✓	-	-	-	✓	✓	✓	-	-	-	-
Howard County General Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Johns Hopkins Bayview Medical Center	✓	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
Johns Hopkins Hospital	✓	-	-	-	-	-	✓	✓	✓	✓		✓	✓
Laurel Regional Hospital		-	-	-	-	-	✓	✓	✓	-	-	-	-
McCreedy Health	✓	-	-	-	-	-	✓		✓	-	-	-	-
Levindale	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓
MedStar Franklin Square Medical Center	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	-
MedStar Good Samaritan Hospital	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	-
MedStar Harbor Hospital	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	-
MedStar Montgomery Medical Center		✓	✓	-	-	-	✓	✓	✓	✓			✓
MedStar Southern Maryland Hospital		✓	-	-	-	-	✓	✓	✓	-	-	-	-
MedStar St. Mary's Hospital	✓	✓	-	-	-	-	✓	✓	✓	✓	✓	-	-
MedStar Union Memorial Hospital	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	-
Mercy Medical Center	✓	✓	-	-	-	-	✓	✓	✓	-	-	-	-

Patient Portal Functionalities													
N=48													
Hospitals	Administration					Clinical							
	Secure messaging*	Pay bill*	Preregister for services*	Request electronic copy of medical record	Update insurance information*	Access full medical record*	Access visit summary	Check test results	Download information about a hospital admission	Self-management tools for chronic conditions*	Submit patient-generated data*	Request prescription refills*	View Patient Specific education
Meritus Medical Center	✓		-	-	-	-	✓	✓	✓	-	-	-	✓
Northwest Hospital Center	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓
Peninsula Regional Medical Center	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	-
Prince George's Hospital Center	-	-	-	-	-	-	✓	✓	✓	-	-	-	-
Saint Agnes Hospital	-	-	-	-	-	-	✓	✓	✓	-	-	-	-
Shady Grove Adventist Hospital	✓	✓	✓	✓	-	-	✓	✓	✓	-	-	-	-
Sinai Hospital	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓
Suburban Hospital	✓	✓	✓	-	✓	-	✓	✓	✓	✓	-	-	✓
Union Hospital of Cecil County	✓	-	-	✓	-	-	✓	✓	-	-	-	-	-
University of Maryland Baltimore Washington Medical Center	-	-	-	-	✓	-	✓		-	-	-	✓	✓
University of Maryland Charles Regional Medical Center	-	-	-	-	-	-	✓	✓	✓	-	-	-	-
University of Maryland Harford Memorial Hospital	-	-	-	✓	-	-	✓	✓	✓	-	-	-	✓
University of Maryland Medical Center	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	✓
University of Maryland Medical Center Midtown Campus	✓	✓	-	-	-	-	✓	✓	✓	-	✓	✓	

Patient Portal Functionalities													
N=48													
Hospitals	Administration					Clinical							
	Secure messaging*	Pay bill*	Preregister for services*	Request electronic copy of medical record	Update insurance information*	Access full medical record*	Access visit summary	Check test results	Download information about a hospital admission	Self-management tools for chronic conditions*	Submit patient-generated data*	Request prescription refills*	View Patient Specific education
University of Maryland Rehabilitation & Orthopedic Institute	✓	-	-	✓	✓	-	✓	✓	✓	-	-	✓	✓
University of Maryland Shore Medical Center at Chestertown	✓	-	-	✓	-	✓	✓	✓	✓	-	-	-	-
University of Maryland Shore Medical Center at Dorchester	✓	-	-	✓	-	✓	✓	✓	✓	-	-	-	-
University of Maryland Shore Medical Center at Easton	✓	-	-	✓	-	✓	✓	✓	✓	-	-	-	-
University of Maryland St. Joseph Medical Center	-	-	-	-	-	-	✓	✓	-	-	-	✓	-
University of Maryland Upper Chesapeake Medical Center	-	-	-	-	-	-	✓	✓	✓	-	-	-	✓
Washington Adventist Hospital	✓	✓	✓	✓	-	-	✓	✓	✓	-	-	-	-
Western Maryland Health System	-	✓	-	-	-	-	✓	✓	✓	-	✓	-	-
Adoption Rate (%)	63	54	17	31	15	15	98	96	94	21	19	44	42

Note: An asterisk (*) denotes those functionalities that may exceed the requirements of Meaningful Use, depending on how each is implemented.

APPENDIX E: POPULATION HEALTH MANAGEMENT TOOLS

The table below details hospitals implementation of population health management tools, including data analytics and electronic care plans. A check mark (✓) indicates hospital use of the specified tool. Strikethroughs (-) indicate tools not yet implemented by a hospital.

Population Health Management Tools				
Hospitals	Data Analytics N=37			Electronic Care Plans N=48
	<i>Clinical Data Analytics</i>	<i>Predictive Analytics</i>	<i>Risk Stratification</i>	
Anne Arundel Medical Center	✓	✓	✓	-
Atlantic General Hospital	-	-	-	-
Bon Secours Baltimore Health System	✓	✓	✓	✓
Calvert Memorial Hospital	✓	-	-	-
Carroll Hospital Center	✓	✓	-	-
Doctors Community Hospital	-	-	-	-
Fort Washington Medical Center	✓	✓	-	-
Frederick Memorial Hospital	-	✓	✓	-
Garrett County Memorial Hospital	-	-	-	✓
Greater Baltimore Medical Center	✓	-	✓	✓
Holy Cross Germantown Hospital	✓	✓	✓	✓
Holy Cross Hospital	✓	✓	✓	✓
Howard County General Hospital	-	-	-	✓
Johns Hopkins Bayview Medical Center	✓	✓	✓	✓
Johns Hopkins Hospital	-	✓	✓	✓
Laurel Regional Hospital	-	-	-	-

Population Health Management Tools				
Hospitals	Data Analytics N=37			Electronic Care Plans N=48
	<i>Clinical Data Analytics</i>	<i>Predictive Analytics</i>	<i>Risk Stratification</i>	
McCready Health	-	-	-	-
Levindale	✓	✓	✓	✓
MedStar Franklin Square Medical Center	✓	-	✓	-
MedStar Good Samaritan Hospital	✓	-	-	-
MedStar Harbor Hospital	✓	-	-	-
MedStar Montgomery Medical Center	-	✓	-	-
MedStar Southern Maryland Hospital	-	-	✓	✓
MedStar St. Mary's Hospital	✓	✓	-	-
MedStar Union Memorial Hospital	✓	-	-	-
Mercy Medical Center	-	-	-	-
Meritus Medical Center	✓	-	-	-
Northwest Hospital Center	✓	✓	✓	✓
Peninsula Regional Medical Center	-	✓	-	-
Prince George's Hospital Center	-	-	-	-
Saint Agnes Hospital	✓	✓	-	✓
Shady Grove Adventist Hospital	✓	-	✓	-
Sinai Hospital	✓	✓	✓	✓
Suburban Hospital	✓	✓	✓	✓
Union Hospital of Cecil County	-	-	-	-

Population Health Management Tools				
Hospitals	Data Analytics N=37			Electronic Care Plans N=48
	<i>Clinical Data Analytics</i>	<i>Predictive Analytics</i>	<i>Risk Stratification</i>	
University of Maryland Baltimore Washington Medical Center	✓	✓	✓	✓
University of Maryland Charles Regional Medical Center	-	✓	✓	✓
University of Maryland Harford Memorial Hospital	-	✓	-	-
University of Maryland Medical Center	✓	-	✓	✓
University of Maryland Medical Center Midtown Campus	-	✓	-	-
University of Maryland Rehabilitation & Orthopedic Institute	-	-	-	-
University of Maryland Shore Medical Center at Chestertown	✓	✓	✓	✓
University of Maryland Shore Medical Center at Dorchester	✓	✓	✓	✓
University of Maryland Shore Medical Center at Easton	✓	✓	✓	✓
University of Maryland St. Joseph Medical Center	-	-	-	-
University of Maryland Upper Chesapeake Medical Center	✓	-	✓	-
Washington Adventist Hospital	✓	-	✓	-
Western Maryland Health System	-	✓	✓	✓
Adoption Rate (%)	76	68	65	44

APPENDIX F: TELEHEALTH CAPABILITIES AND IMPLEMENTATION STATUS

The table below details hospitals implementation status of telehealth, including plans reported by non-adopters to implement telehealth in the future. Hospital telehealth capabilities are also noted, including types of services offered and technologies used. A check mark (✓) indicates hospital use of the specified service or technology. Strikethroughs (-) indicate capabilities not yet implemented by a hospital.

Telehealth Capabilities & Implementation Status									
Hospitals	Status	Services						Technologies	
		Teleradiology	Telediagnosis	Teleconsultation	Emergency	Telebehavioral Health	Remote Patient Monitoring	Real-Time	Store-and-Forward
Anne Arundel Medical Center	Pilot	✓	-	-	-	-	✓	-	✓
Atlantic General Hospital	Sustain	-	✓	-	-	-	-	✓	-
Bon Secours Baltimore Health System	Sustain	✓	✓	✓	-	-	-	✓	✓
Calvert Memorial Hospital	Sustain	✓	-	-	-	-	-	✓	-
Carroll Hospital Center	Optimization	✓	✓	✓	✓	-	-	✓	✓
Doctors Community Hospital	Pilot	-	-	-	✓	-	-	✓	-
Fort Washington Medical Center	Multiple telehealth projects underway	-	✓	-	-	-	-	✓	-
Frederick Memorial Hospital	Optimization	✓	✓	-	-	-	✓	-	✓
Garrett County Memorial Hospital	Implementation	-	-	-	-	-	-	✓	-
Greater Baltimore Medical Center	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Holy Cross Germantown Hospital	Optimization	✓	✓	✓	✓	✓		✓	✓
Holy Cross Hospital	Optimization	✓	✓	✓	✓	✓	✓	✓	✓
Howard County General Hospital	Sustain	✓	✓	-	-	-	-	✓	-

Telehealth Capabilities & Implementation Status									
Hospitals	Status	Services						Technologies	
		Teleradiology	Telediagnosis	Teleconsultation	Emergency	Telebehavioral Health	Remote Patient Monitoring	Real-Time	Store-and-Forward
Johns Hopkins Bayview Medical Center	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Johns Hopkins Hospital	Sustain	✓	-	-	-	-	-	-	✓
Laurel Regional Hospital	Implementation			✓	✓			✓	
McCready Health	Undecided about a telehealth implementation strategy at this time	-	-	-	-	-	-	-	-
Levindale	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
MedStar Franklin Square Medical Center	Implementation	✓	-	✓	-	-	-	-	✓
MedStar Good Samaritan Hospital	Under consideration/development	✓	-	-	-	-	-	-	✓
MedStar Harbor Hospital	Multiple telehealth projects underway	✓	-	-	-	-	✓	-	✓
MedStar Montgomery Medical Center	Sustain	✓	✓	✓	✓	-	-	✓	✓
MedStar Southern Maryland Hospital	Multiple telehealth projects underway	-	✓	✓	-	-	-	✓	-
MedStar St. Mary's Hospital	Implementation	✓		✓	✓	-	-	✓	-
MedStar Union Memorial Hospital	Under consideration/development	✓	-	-	-	-	-	-	✓
Mercy Medical Center	Undecided about a telehealth implementation strategy at this time	-	-	-	-	-	-	-	-
Meritus Medical Center	Multiple telehealth projects underway (specify status of each below)	-	✓	-	-	-	-	✓	-
Northwest Hospital Center	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-

Telehealth Capabilities & Implementation Status									
Hospitals	Status	Services						Technologies	
		Teleradiology	Telediagnosis	Teleconsultation	Emergency	Telebehavioral Health	Remote Patient Monitoring	Real-Time	Store-and-Forward
Peninsula Regional Medical Center	Multiple telehealth projects underway	✓	✓	✓	-	-	-	✓	✓
Prince George's Hospital Center	Implementation phase			✓	✓			✓	-
Saint Agnes Hospital	Pilot	-	-	-	-	-	-	✓	-
Shady Grove Adventist Hospital	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Sinai Hospital	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Suburban Hospital	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Union Hospital of Cecil County	Multiple telehealth projects underway	✓		✓		✓	✓	✓	✓
University of Maryland Baltimore Washington Medical Center	Sustain	✓	-	-	-	-	-	-	-
University of Maryland Charles Regional Medical Center	Multiple telehealth projects underway	✓	-	-	✓	✓	-	✓	-
University of Maryland Harford Memorial Hospital	Pilot	✓	-	-	-	-	-	✓	-
University of Maryland Medical Center	Multiple telehealth projects underway	✓	✓	✓	-	✓	✓	✓	-
University of Maryland Medical Center Midtown Campus	Sustain	✓	-	-	✓	-	-	✓	-
University of Maryland Rehabilitation & Orthopedic Institute	Under consideration/development	✓	-	-	-	-	-	✓	-
University of Maryland Shore Medical Center at Chestertown	Optimization	✓	✓	✓	✓	✓	-	✓	-
University of Maryland Shore Medical Center at Dorchester	Optimization	✓	✓	✓	✓	✓	-	✓	-

Telehealth Capabilities & Implementation Status									
Hospitals	Status	Services						Technologies	
		Teleradiology	Telediagnosis	Teleconsultation	Emergency	Telebehavioral Health	Remote Patient Monitoring	Real-Time	Store-and-Forward
University of Maryland Shore Medical Center at Easton	Optimization	✓	✓	✓	✓	✓	-	✓	-
University of Maryland St. Joseph Medical Center	Under consideration/development	✓	-	-	-	-	-	✓	-
University of Maryland Upper Chesapeake Medical Center	Pilot	✓	-	-	-	-	-	✓	-
Washington Adventist Hospital	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Western Maryland Health System	Planning to implement telehealth by the end of 2016 or beyond	-	-	-	-	-	-	-	-
Adoption Rate (%) N=37		76	43	43	35	22	16	78	38

Note:

- **Under Consideration/Development:** Exploring telehealth; telehealth adoption planned by hospital and in some cases, implementation in progress
- **Pilot:** Conducting limited telehealth tests/trials for a limited period of time
- **Implementation:** Incorporating telehealth technology into clinical workflows and educating staff within a hospital department or departments
- **Optimization:** Telehealth technologies fully functional and telehealth services actively being rendered by hospital department(s)
- **Sustain:** Mature telehealth program; secured funding and general cultural acceptance to support telehealth
- **Multiple Projects:** Several telehealth projects underway, which can be in various phases
- **Undecided:** Hospital plans to implement telehealth unknown.

APPENDIX G: HEALTH IT GROWTH RATE

The table below details baseline information on the number of hospitals that reported adoption of a specified technology in 2012 and 2015. These figures were used to calculate the compound annual growth rate (CAGR) over three periods. CAGR is the measure of growth over multiple periods and helps illustrate the average rate of growth for each technology.

Health IT Growth Rate				
Technology	2012	2015	Period	CAGR 2012-2015
	# of Hospitals		#	%
Electronic Prescribing	10	36	3	53
Patient Portal	12	48	3	59
Telehealth	21	37	3	21

APPENDIX H: MOBILE APPLICATIONS

The table below details mobile applications deployed by hospitals for use by staff and consumers. A check mark (✓) indicates hospital use of the specified mobile application. Strikethroughs (-) indicate mobile application not yet implemented by a hospital.

Mobile Applications										
Hospitals	Hospital Staff N=44						Consumer-Facing N=35			
	EHR	Lab Results	Medical Device Capabilities	Medical Images	Physician Referral/Directory	Practice Management	Emergency/Urgent Care	Medication Tracking	Patient Portal	Physician Directory
Anne Arundel Medical Center	✓	✓	-	✓	-	✓	-	-	✓	-
Atlantic General Hospital	-	-	-	-	-	-	-	-	✓	-
Bon Secours Baltimore Health System	✓	✓	-	✓	-	-	-	✓	✓	✓
Calvert Memorial Hospital	-	-	-	-	-	-	-	-	-	-
Carroll Hospital Center	✓	✓	-	✓	-	-	-	-	✓	-
Doctors Community Hospital	✓	✓	-	✓	✓	-	-	-	✓	✓
Fort Washington Medical Center	✓	✓	-	✓	-	-	-	-	✓	-
Frederick Memorial Hospital	✓	✓	-	-	-	-	✓	-	✓	✓
Garrett County Memorial Hospital	✓	✓	-	✓	-	-	-	-	✓	-
Greater Baltimore Medical Center	✓	✓	-	✓	-	-	-	-	-	-
Holy Cross Germantown Hospital	✓	✓	-	✓	✓	-	-	-	✓	-
Holy Cross Hospital	✓	✓	-	✓	✓	-	-	-	✓	-
Howard County General Hospital	✓	✓	-	✓	✓	-	-	-	✓	✓

Mobile Applications										
Hospitals	Hospital Staff N=44						Consumer-Facing N=35			
	EHR	Lab Results	Medical Device Capabilities	Medical Images	Physician Referral/Directory	Practice Management	Emergency/Urgent Care	Medication Tracking	Patient Portal	Physician Directory
Johns Hopkins Bayview Medical Center	✓	✓	-	✓	-	✓	-	-	✓	-
Johns Hopkins Hospital	✓	✓	-	✓	✓	✓	-	-	✓	✓
Laurel Regional Hospital	✓		-	-	-	-	-	-	-	-
McCready Health	✓	✓	-	-	-	-	-	-	✓	-
Levindale	✓	✓	-	-	-	-	-	-	✓	-
MedStar Franklin Square Medical Center	✓	✓	✓	✓	-	✓	-	-	-	-
MedStar Good Samaritan Hospital	✓	✓		✓	-	✓	-	-	-	-
MedStar Harbor Hospital	✓	✓	✓	✓	-	✓	-	-	-	-
MedStar Montgomery Medical Center	-	-	-	-	-	✓	-	-	-	-
MedStar Southern Maryland Hospital	-	-	-	-	-	-	-	-	✓	✓
MedStar St. Mary's Hospital	✓	✓	-	-	-	-	-	-	✓	
MedStar Union Memorial Hospital	✓	✓	-	✓	-	✓	-	-	-	-
Mercy Medical Center	-	-	-	-	-	-	-	-	✓	-
Meritus Medical Center	✓	-	-	-	-	-	-	-	-	-
Northwest Hospital Center	✓	✓	-	-	-	-	-	-	✓	-

Mobile Applications										
Hospitals	Hospital Staff N=44						Consumer-Facing N=35			
	EHR	Lab Results	Medical Device Capabilities	Medical Images	Physician Referral/Directory	Practice Management	Emergency/Urgent Care	Medication Tracking	Patient Portal	Physician Directory
Peninsula Regional Medical Center	✓	✓	-	-	✓	✓	-	-	-	-
Prince George's Hospital Center	✓	-	-	-	-	-	-	-	-	-
Saint Agnes Hospital	-	-	-	-	-	-	-	-	✓	-
Shady Grove Adventist Hospital	-	-	-	-	✓	-	-	-	✓	-
Sinai Hospital	✓	✓	-	-	-	-	-	-	✓	-
Suburban Hospital	✓	✓	✓	✓	✓	-	-	✓	✓	✓
Union Hospital of Cecil County	✓	✓	-	✓	-	-	-	-	✓	-
University of Maryland Baltimore Washington Medical Center	✓	✓	-	✓	-	-	-	-	✓	-
University of Maryland Charles Regional Medical Center	-	-	-	-	-	-	-	-	-	-
University of Maryland Harford Memorial Hospital	-	-	-	✓	-	-	-	-	✓	✓
University of Maryland Medical Center	✓	✓	-	-	✓	-	-	-	✓	✓
University of Maryland Medical Center Midtown Campus	✓	✓	-	-	✓	-	-	-	✓	✓
University of Maryland Rehabilitation & Orthopedic Institute	✓	✓	-	✓	✓	-	-	-	✓	✓
University of Maryland Shore Medical Center at Chestertown	✓	✓	-	✓	-	-	-	-	✓	-
University of Maryland Shore Medical Center at Dorchester	✓	✓	-	✓	-	-	-	-	✓	-

Mobile Applications										
Hospitals	Hospital Staff N=44						Consumer-Facing N=35			
	EHR	Lab Results	Medical Device Capabilities	Medical Images	Physician Referral/Directory	Practice Management	Emergency/Urgent Care	Medication Tracking	Patient Portal	Physician Directory
University of Maryland Shore Medical Center at Easton	✓	✓	-	✓	-	-	-	-	✓	-
University of Maryland St. Joseph Medical Center	✓	✓	-	-	-	-	-	-	✓	-
University of Maryland Upper Chesapeake Medical Center	-	-	-	✓	-	-	-	-	✓	✓
Washington Adventist Hospital	-	-	-	-	✓	-	-	-	✓	-
Western Maryland Health System	✓	✓	-	-	-	-	-	-	-	-
Adoption Rate (%)	84	77	7	57	27	20	3	6	100	34

APPENDIX I: EHR INCENTIVE PAYMENTS

The table below details the share of EHR incentive payments received among community-based hospitals and health systems.¹²⁵

Share of EHR Incentive Payments			
Hospital Type	Medicare	Medicaid	Total
		%	
Community Based	56	53	55
Health Systems	44	47	45

¹²⁵ Data from the Department of Health and Mental Hygiene as of December 2016. Hospital incentive payment amounts vary according to years of participation and patient population.

David Sharp, Ph.D.
Director
Center for Health Information Technology
and Innovative Care Delivery



4160 Patterson Avenue
Baltimore, MD 21215
410-764-3460
mhcc.maryland.gov